

ROYAL COMMISSION ON TUBERCULOSIS (HUMAN AND BOVINE).

THIRD INTERIM REPORT

OF THE

ROYAL COMMISSION

APPOINTED TO INQUIRE INTO THE RELATIONS OF

HUMAN AND ANIMAL TUBERCULOSIS.

REPORT AND APPENDIX.

Presented to both Houses of Parliament by Command of His Majesty.



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NEW ROYAL COMMISSION ON TUBERCULOSIS.

EDWARD R.

EDWARD THE SEVENTH, by the Grace of God of the United Kingdom of Great Britain and Ireland, King, Defender of the Faith, To

Our Trusty and Well-beloved Sir MICHAEL FOSTER, Knight Commander of Our most Honourable Order of the Bath, Doctor of Medicine, Fellow of the Royal Society, Professor of Physiology in Our University of Cambridge ;

Our Trusty and Well-beloved GERMAN SIMS WOODHEAD, Esquire, Doctor of Medicine, Professor of Pathology in Our University of Cambridge ;

Our Trusty and Well-beloved SIDNEY HARRIS COX MARTIN, Esquire, Doctor of Medicine, Fellow of the Royal Society, Professor of Pathology at University College, London ;

Our Trusty and Well-beloved JOHN MCFADYEAN, Esquire, Principal and Professor of Comparative Pathology and Bacteriology at the Royal Veterinary College ; And

Our Trusty and Well-beloved RUBERT WILLIAM BOYCE, Esquire, Professor of Pathology at University College, Liverpool.

GREETING :

Whereas We have deemed it expedient that a Commission should forthwith issue to inquire and report with respect to Tuberculosis :—

1. Whether the disease in animals and man is one and the same ;
2. Whether animals and man can be reciprocally infected with it ;
3. Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission.

Now know ye, that We, reposing great trust and confidence in your knowledge and ability, have authorised and appointed, and do by these Presents authorise and appoint you, the said Sir Michael Foster, German Sims Woodhead, Sidney Harris Cox Martin, John McFadyean, and Rubert William Boyce, to be Our Commissioners for the purposes of the said inquiry.

And for the better effecting the purposes of this Our Commission We do by these Presents give and grant unto you, or any three or more of you, full power to call before you such persons as you shall judge likely to afford you any information upon the subject of this Our Commission ; and also to call for, have access to, and examine all such books, documents, registers, and records as may afford you the fullest information on the subject, and to inquire of and concerning the premises by all other lawful ways and means whatsoever.

And We do by these Presents authorise and empower you, or any three or more of you, to visit and personally inspect such places as you may deem it expedient so to inspect for the more effectual carrying out of the purposes aforesaid.

And We do further by these Presents will and ordain that this Our Commission shall continue in full force and virtue, and that you, Our said Commissioners, or any three or more of you, may from time to time proceed in the execution thereof, and of every matter and thing therein contained, although the same be not continued from time to time by adjournment.

And We do further ordain that you, or any three or more of you, have liberty

to report your proceedings under this Our Commission from time to time if you shall judge it expedient so to do.

And Our further Will and Pleasure is that you do, with as little delay a possible, report to Us under your hands and seals, or under the hands and seals of any three or more of you, your opinion upon the matters herein submitted for your consideration.

Given at Our Court at St. James's the Thirty-first day of August, 1901 ; in the first Year of Our Reign.

By His Majesty's Command.

CHARLES RITCHIE.

EDWARD R. & I.

EDWARD THE SEVENTH, by the Grace of God, of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas King, Defender of the Faith, To

Our Trusty and Well-beloved WILLIAM HENRY POWER, Esquire, Companion of Our most Honourable Order of the Bath, Fellow of the Royal Society, Medical Officer of the Local Government Board,

GREETING :

Whereas by Warrant under Our Royal Sign Manual, bearing date the Thirty-first day of August, one thousand nine hundred and one, We were pleased to appoint Commissioners to inquire and report with respect to Tuberculosis, and to authorize the late Sir Michael Foster to act as Chairman of the Commission :

And whereas the Chairmanship of the Commission is at this present void.

Now know ye that We, reposing great trust and confidence in your knowledge and ability, have authorized and appointed, and by these Presents authorize and appoint you, the said William Henry Power, to be Chairman of the said Commission in the room of the said Sir Michael Foster, deceased.

Given at Our Court at Saint James's the Eighteenth day of March, 1907 ; in the seventh Year of Our Reign.

By His Majesty's Command.

H. J. GLADSTONE.

TO THE KING'S MOST EXCELLENT MAJESTY.

May it please your Majesty,

We, your Majesty's Commissioners, appointed to inquire and report with respect to Tuberculosis :—

1. Whether the disease in animals and man is one and the same ;
2. Whether animals and man can be reciprocally infected with it ;
3. Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission ;

Humbly submit the following Further Report containing an account of certain experiments we have carried out regarding the Infectivity of the Milk and Faeces of Naturally Infected Tuberculous Cows, that is, Cows that had contracted the disease in the ordinary way.

We wish to take this opportunity of expressing our deep sense of the great loss caused not only to ourselves but also to the whole country by the lamented death of Sir Michael Foster, the late Chairman of this Commission.

Since the date of our Second Interim Report the work of the Commission has been mainly directed to determining the special characters of the bacilli which are the cause of tuberculosis in animals other than the cow, and the relationships of the different types of tubercle bacilli which we have encountered in man and certain of the lower animals. The investigations bearing on these and other matters referred to in that Report as engaging our attention are not yet complete and the publication of the results obtained must therefore be postponed.

In the meantime we have thought it advisable to describe the results of a series of experiments which have been carried out by us with a view of obtaining information regarding the excretion or discharge of tubercle bacilli in the Milk and Faeces of tuberculous cattle.

In our Second Interim Report we expressed the opinion, as a result of our investigations, that a very considerable amount of disease and loss of life, especially among infants and children, must be attributed to the consumption of cow's milk containing tubercle bacilli.

Tuberculosis involving the udder is comparatively common in cows, and in such cases their milk always contains tubercle bacilli and is therefore dangerous for human beings consuming it. It was, however, undecided what is the danger, if any, attaching to the milk of tuberculous cows in which the udder presents no evidence of disease. We therefore took the opportunity of making a number of observations and experiments bearing on this point. The experiments were made with the milk of cows which had contracted the disease in the natural way.

In natural tuberculosis in the cow, cases which show such obvious symptoms of the disease as emaciation and cough should be considered separately from the cases in which there are no such signs and in which the disease is to be recognised during life only by means of the injection of tuberculin.

None of the cows investigated showed any sign of disease of the udder during life, and in all, after slaughtering, the udder was carefully examined for tuberculous lesions and tubercle bacilli. No tuberculosis was found except in one case (Cow F) in which one quarter of the udder showed four small nodules. These could not possibly have been detected during life.

We found that the milk of the cows obviously suffering from tuberculosis (see Appendix ; Cows B, C, and F) contained tubercle bacilli whether the milk was obtained in the ordinary way or was withdrawn from the teat by means of a sterilised

catheter. The presence of tubercle bacilli in the milk of cows clinically recognisable as tuberculous confirms the opinion we expressed in our Second Interim Report that the milk of such cows must be considered dangerous for human beings.

The experiments which we have carried out with regard to the infectivity of the faeces of tuberculous cows were dictated by knowledge of the fact that dirt of various kinds from cows and the cow-shed is almost constantly present in milk as it reaches the consumer. Cows suffering from extensive tuberculosis of the lungs must discharge considerable numbers of bacilli from the air passages in the act of coughing, and some of the bacilli thus expelled may find their way into the milk. But our experiments indicate that the excretion of cows obviously suffering from tuberculosis of the lungs or alimentary canal must be regarded as much more dangerous than the matter discharged from the mouth or nostrils. We have found that even in the case of cows with slight tuberculous lesions tubercle bacilli in small numbers are discharged in the faeces, while as regards cows clinically tuberculous our experiments show that the faeces contain large numbers of living and virulent tubercle bacilli.

The presence of tuberculous cows such as B, C, and F in company with healthy cows in the cow-shed is therefore distinctly dangerous, as some of the tubercle bacilli which escape from their bodies in the excrement are almost certain to find their way into the milk.

The experiments are described in detail in the Appendix attached to this Report. They were carried out by Dr. F. Griffith under our supervision, and we desire to express our high appreciation of the skill and care devoted by him to the work.

(Signed) W. H. POWER, *Chairman.*

G. SIMS WOODHEAD.

SIDNEY MARTIN.

J. McFADYEAN.

RUBERT BOYCE.

EDWARD J. STEEGMANN, *Secretary.*

January, 1909.

APPENDIX

BY

DR. F. GRIFFITH.

INTRODUCTION.

THIS Appendix gives the results of inoculation and feeding experiments made with the faeces and milk of naturally tuberculous cattle. Observations have been made on six milch cows. Three of the animals, B, C, and F, showed clinical evidence of tuberculosis but in none during life could any tuberculous disease of the udder be detected. The object of this investigation was to ascertain if tubercle bacilli were present in the faeces and milk of these animals.

DESCRIPTION OF METHODS USED.

For the purposes of the experiments a considerable quantity of faecal matter was required, and in order to avoid risk of contamination from the genito-urinary passages the following method of collection was employed. The action of the rectum was stimulated by the injection into it of air through a sterile glass tube and the faeces were received directly into a pail which was applied to the margin of the anal orifice. These precautions were necessary as in one case, B, there was a purulent discharge from the vagina and the post-mortem examination in three cases, B, C, and F, revealed extensive tuberculous disease of the uterus. A portion of the faeces was rubbed up in a mortar with sufficient salt solution to moisten it and pressed through muslin to form an emulsion. This emulsion was used for the feeding and inoculation of guinea-pigs. The inoculation of fresh faeces into guinea-pigs frequently causes death within a few days and it was possible to estimate roughly a minimal fatal dose of the emulsion which was prepared each day in the same way. It was found that 0·5 cubic centimetre of the emulsion almost invariably caused death from acute peritonitis while after the inoculation of 0·05 cubic centimetre all the animals survived. The intraperitoneal method of inoculation was almost exclusively used.

The infectivity of the faeces was also tested by feeding guinea-pigs and swine. The swine were young animals about 11 weeks old, belonging to three litters and all obtained from the same farm. They were all tested with tuberculin before being used for experiment and gave negative results in each case. Two animals were kept as controls, one from each of two litters, and when killed were found to be free from tuberculosis. No control to the third litter was kept, but all the eight pigs belonging to it though used for experiment were quite healthy when killed.

The milk of five of the cows, B, C, D, E, and F, was tested for the presence of tubercle bacilli and strict precautions were taken to ensure absence of contamination during its collection. A metal catheter, connected by pressure tubing to a flask, was inserted into the milk sinus of the udder, a separate apparatus being used for each quarter, and the milk was withdrawn from the udder by the exhaustion of the air in the flask. Before the insertion of the catheter each teat was washed with a solution of perchloride of mercury and with methylated spirit, and the opening was inspected to ensure that no faecal matter was pushed in with the catheter.

The milk thus obtained was tested as to the presence in it of tubercle bacilli by the inoculation of guinea-pigs and occasionally of rabbits. Two guinea-pigs were inoculated intraperitoneally from each quarter and each animal received, when sufficient milk was obtained, a dose of 10·0 cc. of uncentrifuged milk plus the deposit of 20·0 cc. of centrifuged milk, or sometimes 6·0 cc. plus the deposit of 24·0 cc.

In the case of three cows young swine were fed in each instance with the milk from the different quarters mixed together.

DETAILS OF THE EXPERIMENTS.

1. Animals showing clinical signs of disease.
2. Animals in which the only evidence of disease during life was a positive reaction to tuberculin.

1.

COW B.

This cow was a shorthorn and had calved four weeks previously. It was in poor condition and had a short infrequent cough; it reacted positively to the tuberculin test.

When killed it was found to have severe general tuberculosis. The lungs contained caseous masses which had broken down and had become partly emptied with the formation of cavities. There were numerous tubercles along the whole length of the trachea and the tonsils were infiltrated with breaking down caseous tissue. In the small intestine there were about 60 ulcers varying up to 1·5 cubic centimetre in diameter and scattered caseous nodules not yet ulcerated. The bronchial, mediastinal, mesenteric and portal glands were greatly enlarged and replaced by firm caseo-necrotic tissue. The posterior pharyngeal, and the cervical glands were large and extensively caseated. The walls of the uterus were thick, firm, and infiltrated with tuberculous tissue, while the cavities were filled with muco-purulent discharge such as issued from the vagina during life. The udder was free from tuberculous lesions.

The calf from this animal was in good condition and apparently healthy, but the post-mortem examination revealed disseminated tuberculosis. It was evident from the distribution of the disease (see post-mortem), and its extent in relation to the age of the calf, that the tuberculosis had been acquired in utero. That the cow had been able to bear a calf is remarkable considering the advanced tuberculous disease of the uterus, though probably the pregnancy itself had hastened the progress of the disease.

INOCULATION AND FEEDING EXPERIMENTS WITH FAECES.

The faeces of Cow B passed on the 1st, 3rd, 4th, 5th, 8th, and 9th of October, 1907, were tested for the presence of tubercle bacilli by the inoculation of guinea-pigs.

In all 25 guinea-pigs were inoculated intraperitoneally, of which 8 succumbed to acute infection in from one to two days. One, killed after 27 days, was free from tuberculosis. The remaining 16 were killed after about four weeks and were found to be tuberculous — that is, all the guinea-pigs with one exception inoculated with faeces which lived for a sufficient period for tuberculosis to develop became tuberculous. The doses in relation to the amount of faeces passed were exceedingly small, consisting in the majority of cases of 0·05 cc. of a thick filtered emulsion.

Guinea-pigs were also fed with the faeces. Six were fed from October 1st to October 9th inclusive with faeces mixed with sterilized milk, receiving no other food, and when killed were healthy.

Two guinea-pigs were fed each day from October 1st to October 9th, sixteen in all, with a single dose of faeces administered by means of a pipette, each receiving 1·0 cc. of the emulsion used for the intraperitoneal inoculations. They were killed after 14 weeks and were free from tuberculosis in spite of the fact that they received 50 times the amount of faecal emulsion which invariably caused tuberculosis when inoculated intraperitoneally.

Four young swine were fed with faeces mixed with sterilized milk from October 1st to October 9th, 1907, the total amount shared between the four from the same trough being 19·1 kilogrammes. They were tested with tuberculin 58 days after the experiment began and all gave positive reactions, the rise of temperature varying in the individual cases from 1·3° C. to 3·0° C. They were killed after periods varying from 63 to 100 days since the first feeding, and all showed generalized tuberculosis (see post-mortem records).

INOCULATION AND FEEDING EXPERIMENTS WITH MILK.

The milk of Cow B, collected in the manner previously described, was inoculated into guinea-pigs on the 11th, 14th, 15th, 16th, 17th, 18th, and 19th of October, 1907. The inoculations were all made intraperitoneally, and two guinea-pigs were used for the milk of each quarter, each animal receiving a dose consisting of the deposit of 20·0 cubic centimetres of centrifuged milk plus 10·0 cubic centimetres of uncentrifuged milk (except on the first day when each received the deposit of 15·0 cubic centimetres).

In all 56 guinea-pigs were inoculated. One was killed in 79 days and had general tuberculosis without disease of the omentum. In these experiments I have not accepted tuberculosis in a guinea-pig as giving positive evidence of the presence of tubercle bacilli in the material inoculated unless there were lesions in the omentum, muscle, or skin at the seat of inoculation containing tubercle bacilli, and therefore this guinea-pig was rejected. The remaining 55 guinea-pigs were killed, the majority after 11 weeks, and all were healthy with the exception of one which had tuberculosis obviously due to the inoculation.

On November 5th, 1907, the cow was inoculated with 20·0 cubic centimetres of tuberculin under the skin of the neck after which she became ill, with laboured breathing. The next day, 19 hours later, the milk was inoculated as before into eight guinea-pigs of which four subsequently became tuberculous. The milk collected on November 7th, 43 hours after the inoculation of tuberculin, caused tuberculosis in seven out of the eight guinea-pigs inoculated.

Two young pigs were fed from October 14th to October 20th inclusive, receiving between them 18·4 litres of milk. They were killed 86 days after the first feeding and showed no tuberculosis. A third pig, which received on November 1st a single feed of 2·8 litres of milk, when killed 69 days later was healthy.

The following experiments were performed in order to gain information as to the likelihood of the milk becoming infected during the ordinary process of milking.

On November 4th, the cow was milked in the ordinary way, though with special precautions as to cleanliness, into an open pail; two out of four guinea-pigs inoculated with the mixed milk became tuberculous.

On November 5th, before the tuberculin inoculation, the cow was milked without being cleansed in any way: two out of four guinea-pigs inoculated with the mixed milk became tuberculous.

The experiments are not conclusive since it is possible that the tubercle bacilli were excreted in the milk, although use of it on seven separate occasions two or three weeks previously had caused tuberculosis in one guinea-pig only. In an animal so severely infected as this cow an invasion of the blood stream by tubercle bacilli is always liable to occur and these may be eliminated in the milk.

This natural distribution of tubercle bacilli in the course of the disease may account for the presence of tubercle bacilli in the milk after the inoculation of tuberculin, this inoculation being coincident with and not the cause of the dissemination.

COW C.

This cow was a Jersey with obvious clinical signs of tuberculosis. She was emaciated and feeble, breathed hard, and had a frequent cough. Her temperature was febrile and there was no rise sufficient to constitute a positive reaction after the inoculation of tuberculin. After death she was found to have severe thoracic tuberculosis: the lungs were closely beset with caseous nodules and large bright yellow caseo-necrotic masses, many of which were softening and breaking down. In several cases caseo-purulent substance was seen protruding from a necrotic mass into a bronchus and the trachea was filled with a cast of inspissated muco-pus. The bronchial and mediastinal glands were greatly enlarged and caseo-necrotic throughout. The Peyer's patches of the small intestine all contained a few caseous nodules up to a hemp-seed in size, and there were several small ulcers up to 5·0 millimetres in diameter. One mesenteric gland was greatly enlarged and caseous. The uterus was extensively tuberculous and the cavities were filled with purulent fluid and caseous flocculi. The udder was normal.

INOCULATION AND FEEDING EXPERIMENTS WITH FAECES.

The faeces of Cow C were tested for the presence of tubercle bacilli on the 24th, 25th, 28th, 29th, and 30th of October, 1907, by the inoculation of 30 guinea-pigs. Of these 17 became tuberculous : the rest died too soon for tuberculosis to develop.

Four guinea-pigs were fed continuously for six days with faeces mixed with sterilized milk : one became tuberculous, the rest remained healthy.

Each of ten guinea-pigs received by the mouth from a pipette 1·0 cubic centimetre of the faecal emulsion used for the inoculation experiments, and when killed after about 90 days all were found to be free from tuberculosis.

The following experiment gives some idea of the large numbers of tubercle bacilli in the faeces of this cow. One gramme of faeces was added to two litres of sterilized water, and two guinea-pigs were inoculated intraperitoneally, one with one cubic centimetre, the other with two cubic centimetres of the mixture. Both developed severe general tuberculosis, the former dying in 63 days.

A young pig was fed with the faeces from October 23rd to October 30th inclusive, receiving 5·56 kilogrammes mixed with sterilized milk. It was killed 48 days after the first feeding and showed enlargement and caseation of the submaxillary and mesenteric glands and disseminated tuberculosis.

INOCULATION EXPERIMENTS WITH MILK.

The milk was collected by catheter on each of three days and was inoculated intraperitoneally into guinea-pigs and rabbits. Each guinea-pig received 10·0 cubic centimetres of uncentrifuged milk added to the deposit of 40·0 cubic centimetres of centrifuged milk.

None of the animals inoculated on October 25th became tuberculous. The milk of October 29th caused tuberculosis in two guinea-pigs and that of October 30th caused tuberculosis in three rabbits and four guinea-pigs. The infectivity of the milk with reference to the individual quarters was irregular, but each quarter at some time gave tuberculous milk.

The explanation of this fact may be that the quantity of milk inoculated was not sufficient to be representative rather than that the elimination of tubercle bacilli was irregular, since in several of the animals the slight amount of disease produced showed that only a few bacilli had been inoculated.

COW F.

This animal was very ill : she was emaciated and feeble, and was kept under observation only for a few days, after which she was killed.

The post-mortem examination revealed severe general tuberculosis apparently originating in the alimentary tract. In the left hind quarter of the udder, in the tissue forming the wall of the main sinus near the teat, there were four reddish grey caseating nodules up to a pea in size. The rest of this quarter and the other three quarters were normal in appearance.

INOCULATION EXPERIMENTS WITH FAECES AND MILK.

From the faeces of Cow F, excreted January 29th, 1908, seven guinea-pigs were inoculated intraperitoneally ; of these four died too early for tuberculosis to have developed, and the remaining three, when killed after 33 days, had general tuberculosis.

The milk was collected on each of four days and inoculated into 32 guinea-pigs of which 11 died prematurely. The remaining 21 developed general tuberculosis. Many of the guinea-pigs died in from 18 to 24 days with tuberculosis resembling that following the intraperitoneal inoculation of 0·1 mg. of culture.

2.

COW A.

This animal was a shorthorn heifer in good condition and the diagnosis of tuberculosis depended entirely on the positive result of the tuberculin test.

When killed it was found to have on the right side an enlarged retro-pharyngeal gland which was cystic, with thick fibrous walls and filled with breaking down caseo-necrotic substance. In the Peyer's patches of the small intestine there were three grey nodules containing caseous foci, two soft caseous nodules and a small ulcer in which no tubercle bacilli could be demonstrated. There was also a caseous nodule in a mesenteric gland, caseation of a gluteal gland, and four tubercles in the lungs. All other organs and glands were healthy.

The faeces were collected for 9 days from September 30th, 1907, to October 9th, 1907, and were used to inoculate and feed 41 guinea-pigs of which only one died prematurely.

None of the guinea-pigs developed tuberculosis.

Four young swine were fed for the same length of time with the faecal matter mixed with sterilized milk, the total amount shared between the four from the same trough being 25·6 kilogrammes of faeces. They were tested with tuberculin 59 days after the experiment began and one alone reacted, giving a rise of temperature of 2·6° C. This animal was killed a week later and the post-mortem examination showed tuberculosis of the submaxillary glands on the left side, a caseous focus in one mesenteric gland, four caseating tubercles in the liver and about thirty on the surface beneath the pleura of each lung. The remaining three swine were killed after 90 days and were found to be free from tuberculosis.

COW D.

This animal was fat and in good condition, and the diagnosis of tuberculosis rested entirely upon the positive result of the tuberculin test. At the post-mortem examination the lungs were found to contain discrete tuberculous nodules several of which measured about 10·0 by 6·0 by 5·0 cm. On section, these were composed of softening yellow caseo-necrotic substance surrounded by fibrous walls. A few of the nodules had ulcerated into the bronchi in which soft caseous substance was seen, and muco-pus could be squeezed out of many of the bronchioles. The bronchial and mediastinal glands were enlarged and were to a large extent replaced by bright yellow caseo-necrotic gritty masses.

There was no tuberculosis of any other organ or gland in the body.

INOCULATION AND FEEDING EXPERIMENTS WITH FAECES.

The faeces of Cow D were tested on February 20th and 21st and March 24th, 1908, by the inoculation of guinea-pigs and rabbits. Eleven guinea-pigs were inoculated intraperitoneally, of which two became tuberculous; two showed a few tubercles in the omentum containing moderately numerous acid fast bacilli and the remaining seven were free from tuberculosis. Two out of three rabbits inoculated developed tuberculosis. Two swine were fed for 14 days with the faeces and when killed after 79 and 99 days were found to be healthy.

INOCULATION AND FEEDING EXPERIMENTS WITH MILK.

The milk was collected by catheter on each of 8 days and was inoculated intraperitoneally into guinea-pigs; in all 60 guinea-pigs were used. None developed tuberculosis.

In several guinea-pigs the omentum contained a few translucent, sometimes whitish, foci, in which a few acid fast bacilli were demonstrated in smear preparations. These bacilli were evidently dead, since guinea-pigs inoculated with the omentums did not develop tuberculosis, and only streptococci were isolated in cultures made from the foci.

COW E.

The condition of this cow was very good: she gave a positive reaction to the tuberculin test. After death there were found in the lungs three small tuberculous nodules and in the caudal mediastinal gland 30 to 40 caseo-calcareous nodules up to

a pea in size. In a suprarenal body there was a tubercle the size of a rape-seed in which tubercle bacilli were demonstrated. There was no tuberculosis elsewhere.

INOCULATION AND FEEDING EXPERIMENTS WITH FAECES.

From the faeces passed on four days 18 guinea-pigs were inoculated intraperitoneally. Of these five died (three prematurely) and the rest were killed after 50 days. All were free from tuberculosis.

Two swine fed for 14 days with the faeces remained healthy.

INOCULATION AND FEEDING EXPERIMENTS WITH MILK.

The milk was collected by catheter on each of six days and 36 guinea-pigs and four rabbits were inoculated intraperitoneally. None developed tuberculosis.

Two swine were fed, each with 650·0 cc., and both remained healthy.

SUMMARY OF RESULTS.

The faeces of five naturally tuberculous cows, out of the total number of six so far investigated, have been found to contain living and virulent tubercle bacilli.

Three of these animals, Cows B, C, and F, were severely diseased and were eliminating large numbers of tubercle bacilli : this is shown by the occurrence of tuberculosis after the inoculation of very small doses of faecal matter in all but one of the guinea-pigs which survived a sufficient length of time, and by the fact that all the swine fed became tuberculous.

Two of the cows, A and D, were in apparently excellent condition of health. One, Cow A, showed after death a caseous and cystic posterior pharyngeal gland, a few small nodules in the intestine, and slight disseminated tuberculosis. The faeces of this animal caused tuberculosis in one out of four swine fed : the other three swine and all the guinea-pigs inoculated remained healthy. The other cow, D, had tuberculosis of the lungs, bronchial and mediastinal glands, without any disease elsewhere. The faeces of this animal caused tuberculosis in three guinea-pigs and two rabbits ; two swine fed remained healthy.

The faeces of the sixth cow, E, which had slight tuberculosis of the lungs and a mediastinal gland, did not give rise to tuberculosis in any of the animals inoculated. Four, Cows A, B, C, and F, out of the five cows which gave positive results showed some tuberculosis of the alimentary tract, but in at least one case, Cow C, it was not sufficient to account for the large numbers of tubercle bacilli in the faeces. These bacilli must have been coughed up from the lungs and swallowed.

Tuberculosis was present in the uterus of each of the severely infected cows and the uterine discharge contained numerous tubercle bacilli. Such a condition constitutes another source of infection.

The milk of two of the cows, B and C, caused, though not invariably, tuberculosis in guinea-pigs inoculated with relatively small doses. The milk was withdrawn from the udder by catheterization, and post-mortem examination of the udders revealed no macroscopic evidence of tuberculosis. Small pieces were examined histologically by Dr. Eastwood and were found to be normal, but it is of course impossible positively to exclude microscopical lesions. The milk of a third cow, F, caused severe tuberculosis in every guinea-pig which lived a sufficient period of time after inoculation. The udder, except for four small nodules in the left hind quarter, was normal to the naked eye : the animal was very ill at the time the milk was collected.

The milk of the remaining two cows, D and E, tested did not give rise to tuberculosis in any of the animals inoculated.

The results of the post-mortem examinations of the naturally infected cows and the details of the inoculation and feeding experiments with guinea-pigs and swine are included in the following pages.

COW B.

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SHORTHORN COW B.

POST-MORTEM EXAMINATION.

General Condition.—Poor.*Tongue.*—Normal.*Tonsils.*—The tonsils on both sides were enlarged and firm and were infiltrated with tuberculous tissue, in parts breaking down forming ragged walled cavities.*Pharynx.*—Normal.*The Right Submaxillary and Right Superior Cervical Glands.*—Each showed an early caseous nodule.*The Left Submaxillary Gland* was normal.*The Left Retro-pharyngeal Gland* was more than half caseous. The right retro-pharyngeal gland was twice the size of the left and almost caseous throughout.*Cervical Glands.*—The left superior cervical, and the middle and lower cervical glands on both sides contained firm caseous nodules, replacing the greater part of the gland substance.*Abdomen.**In the Omentum.*—There were a few scattered grey nodules.*On the Peritoneal Surface of the Diaphragm* there were loosely attached fibro-caseous nodules occurring singly and in clusters.*Intestines.*—In each of the Peyer's patches of the first two-thirds of the small intestine there were from one to eight ulcers varying up to 1·5 cm., they were circular and had slightly raised undermined edges with injected vessels around. In some the floors were clean, in others covered with a little caseous substance; the bases and sides were infiltrated with caseous tubercles. In several places the ulcers coalesced becoming serpiginous. The Peyer's patches in the last third of the small intestine were not affected. Altogether about sixty ulcers were counted and there were also scattered small caseous nodules not yet ulcerated.*Large Intestine.*—Normal.*Two Gastric Glands* were partly caseous.*Mesenteric Glands.*—The mesenteric glands were greatly enlarged and all were replaced by caseo-necrotic tissue which was pinkish in parts and bright yellow in others.*Colic Glands.*—Similarly affected.*Spleen.*—In the centre of the spleen there was a bright yellow softening caseous gritty nodule 5 mm. in diameter.*Liver.*—The surface of the liver showed numerous depressions varying up to 1·0 and 1·5 cm., they were dark red in colour and on section were composed of soft tissue, from which blood welled readily; when all the blood was squeezed out a spongy tissue was left, quite different from the parenchyma. These areas were scattered throughout the liver substance. No tubercles could be seen on the surface and on section through the substance, one miliary nodule was found.*Portal Glands.*—In the portal glands there was an

occasional caseous gritty nodule up to a hemp seed in size.

Kidneys.—The cortices of the kidneys were speckled with grey nodules varying up to a millet seed in size. On section they were irregular, many elongated, and the majority showed minute white centres.*Suprarenal Bodies.*—In the right suprarenal there was a nodule nearly 1·0 cm. in diameter waxy and caseous with a more opaque yellowish centre.*Left Suprarenal Body.*—Normal.*Iliac Glands.*—Five iliac glands were greatly enlarged and practically replaced by waxy caseated tissue.*Lumbar Glands.*—One lumbar gland contained a caseating nodule; the other glands appeared normal.*Coeliac Glands.*—Enlarged and caseous throughout.*Uterus.*—The cotyledons of the uterus were large and firm and on section the walls were found to be composed throughout of tuberculous tissue. The internal surfaces were roughened and covered with yellow muco-purulent discharge, such as constantly issued during life from the vagina.*Thorax.**Pleura.*—Along the ribs on the parietal pleura there were numerous flattened tuberculous nodules, in places forming thickened areas and in others clusters.*Lungs.*—The right anterior lobe was adherent to the pericardium and to the pleura by means of thickened caseous growths. On the surfaces of the lungs there were scattered fibro-caseous nodules and fairly numerous fibrous nodules in the fringes along the margins. About one third of the left caudal lobe and half of the right, at their posterior extremities, were in a condition of caseous pneumonia. On section the masses were soft and caseo-purulent and many had become partly emptied leaving cavities. The rest of the lung tissue was crepitant containing a few pneumonic lobules and was beset with numerous caseating miliary tubercles.*Caudal Mediastinal Gland.*—Measured 27·0 by 12·0 cm. and weighed 2lbs. 4ozs. On section it consisted entirely of waxy caseating tissue in which were embedded bright yellow necrotic nodules. The other mediastinal and bronchial glands were enlarged and resembled the caudal mediastinal gland.*Trachea.*—Along the whole length of the trachea were numerous small flattened congested tubercles and there was a caseous nodule on the larynx.*Heart.*—Normal.*The Right Axillary and Right Gluteal Glands.*—Each showed a small caseous nodule.*Parotid, Prescapular, Prepectoral, Left Axillary, Left Gluteal, Precurral, Popliteal, and Ischiatic Glands.*—Normal.*Microscopical Examination.*

(Smear preparations.)

Liver (haemorrhagic area).—No tubercle bacilli.*Kidney (nodule).*—No tubercle bacilli.

CALF OF COW B.

POST-MORTEM EXAMINATION.

Condition.—Good.*Abdomen.**Liver.*—In the liver just beneath the capsule there were thirteen grey tubercles with minute opaque centres about the size of rape seed. Similar tubercles were seen scattered throughout the substance, one

attaining the size of a millet seed; they were grey with yellowish slightly gritty centres.

Portal Glands.—The portal glands were enlarged and on section they showed their cortices fairly closely filled with yellow gritty caseous nodules up to 3 mm. in diameter; in places becoming confluent they formed caseous patches.*Spleen.*—In the spleen there were five grey nodules,

with a fine yellowish caseous gritty central network, varying up to a wheat grain in size.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—In one mesenteric gland there was a single caseous tubercle.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant and pink except for some congestion of the dorsal surfaces of the caudal lobes; they showed on the surface a few scattered reddish nodules, some with definite caseous foci.

Mediastinal and Bronchial Glands.—The caudal mediastinal gland showed part of its cortex filled with a coarse yellowish caseous network gritty from calcification, the rest of the gland containing discrete nodules. The other mediastinal and bronchial glands showed

discrete yellowish caseous gritty nodules up to 5·0 mm. in diameter.

Heart.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

The right Pre-crural Gland showed one yellowish caseous nodule about 2 mm. in diameter

Various Lymphatic Glands.

Parotid, Submaxillary, Cervical, Pharyngeal, Pre-scapular, Axillary, Left Pre-crural, Pudic, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Testes.—Normal.

Microscopical Examinations.

(Smear preparations.)

Liver (nodule).—Three tubercle bacilli seen.

Portal Gland.—Showed a few tubercle bacilli.

Lung (nodule).—One tubercle bacillus seen.

Mesenteric Gland.—Showed a few tubercle bacilli.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH FAECES OF COW B.

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
2648		2·0 cc.	Died 1 day	Acute infection. No T.
2649		1·5 cc.	Died 1 day	Acute infection. No T.
2650	October 1, 1907	·5 cc.	Killed 31 days	Early G.T.
2651		1·0 cc.	Died 1 day	Acute infection. No T.
2652		1·0 cc.	Died 2 days	Acute infection. No T.
2669		·5 cc.	Died 1 day	Acute infection. No T.
2670	October 3, 1907	·5 cc.	Died 1 day	Acute infection. No T.
2671		·5 cc.	Killed 28 days	G.T.
2672		·05 cc.	Killed 29 days	Early G.T.
2685		·05 cc.	Killed 28 days	Omentum contained 8 nodules and spleen 5. Caseation of portal gland.
2686	October 4, 1907	·05 cc.	Killed 28 days	A few tubercles in omentum and on peritoneum: opaque foci in spleen and pyloric gland.
2687		·05 cc.	Killed 28 days	Several tubercles in omentum, and caseation of pyloric, portal, and lumbar glands.
2692		·05 cc.	Killed 30 days	Early G.T.
2693	October 5, 1907	·05 cc.	Killed 30 days	Early G.T.
2694		·05 cc.	Died 1 day	Acute infection. No T.
2695		·05 cc.	Killed 30 days	Early G.T.
2710		·05 cc.	Killed 27 days	No tuberculosis. 1 inoculation intra-caecal.
2711	October 8, 1907	·05 cc.	Killed 27 days	G.T.
2712		·05 cc.	Killed 27 days	G.T.
2713		·05 cc.	Killed 27 days	G.T.
2720		·1 cc.	Died 2 days	Acute infection. No T.
2721		·05 cc.	Killed 27 days	Omentum thickened; pyloric gland caseous.
2722	October 9, 1907	·05 cc.	Killed 27 days	Similar to above.
2723		·05 cc.	Killed 27 days	Similar plus caseation of lumbar and portal glands.
2724		·05 cc.	Killed 27 days	Early G.T.

GUINEA-PIGS FED WITH FAECES OF COW B.

DOSE IN EACH CASE 1·0 CC. OF FAECAL EMULSION.

Number	Date of Feeding.	Duration of Life.	Result.
2653		Killed 98 days	No tuberculosis.
2654	October 1, 1907	Killed 98 days	No tuberculosis.
2665		Killed 98 days	No tuberculosis.
2666	October 2, 1907	Killed 98 days	No tuberculosis.
2673		Killed 26 days	No tuberculosis.
2674	October 3, 1907	Killed 98 days	No tuberculosis.
2688		Killed 98 days	No tuberculosis.
2689	October 4, 1907	Died 81 days	No tuberculosis.
2696		Killed 98 days	No tuberculosis.
2697	October 5, 1907	Killed 98 days	No tuberculosis.
2704		Killed 98 days	No tuberculosis.
2705	October 7, 1907	Killed 98 days	No tuberculosis.
2708		Killed 98 days	No tuberculosis.
2709	October 8, 1907	Killed 98 days	No tuberculosis.
2718		Killed 98 days	No tuberculosis.
2719	October 9, 1907	Killed 98 days	No tuberculosis.

GUINEA-PIGS FED CONTINUOUSLY WITH FAECES OF COW B MIXED WITH STERILIZED MILK.

Number.	Date of Feeding.	Duration of Life.	Result.
2642		Killed 56 days	No tuberculosis.
2643		Killed 97 days	No tuberculosis.
2644	From October 1, 1907, to October 9, 1907.	Killed 97 days	No tuberculosis.
2645		Killed 105 days	No tuberculosis.
2646		Killed 105 days	No tuberculosis.
2647		Died 7 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW B.

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
2734			R.F.	Killed 83 days	No tuberculosis.
2735			R.F.	Killed 83 days	No tuberculosis.
2736		5·0 cc. of milk plus deposit of 20·0 cc.	R.H.	Killed 83 days	No tuberculosis.
2737	October 11, 1907	obtained by the centrifuge.	R.H.	Killed 83 days	No tuberculosis.
2738			L.F.	Killed 83 days	No tuberculosis.
2739			L.F.	Killed 83 days	No tuberculosis.
2740			L.H.	Killed 83 days	No tuberculosis.
2741			L.H.	Killed 83 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW B—*continued.*

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
2742			R.F.	Killed 80 days	No tuberculosis.
2743			R.F.	Killed 80 days	No tuberculosis.
2744		10·0 cc. of milk plus the deposit of 20·0 cc. obtained by the centrifuge.	R.H.	Killed 80 days	No tuberculosis.
2745	October 14, 1907		R.H.	Killed 80 days	No tuberculosis.
2746			L.F.	Killed 80 days	No tuberculosis.
2747			L.F.	Died 74 days	No tuberculosis.
2748			L.H.	Killed 80 days	No tuberculosis.
2749			L.H.	Killed 80 days	No tuberculosis.
2752			R.F.	Killed 79 days	No tuberculosis.
2753			R.F.	Killed 79 days	No tuberculosis.
2754			R.H.	Killed 79 days	No tuberculosis.
2755	October 15, 1907	do.	R.H.	Killed 79 days	No tuberculosis.
2756			L.F.	Killed 79 days	No tuberculosis.
2757			L.F.	Killed 79 days	No tuberculosis.
2758			L.H.	Killed 79 days	No tuberculosis.
2759			L.H.	Killed 79 days	No tuberculosis.
2760			R.F.	Killed 79 days	No tuberculosis.
2761			R.F.	Killed 79 days	No tuberculosis.
2762			R.H.	Killed 79 days	No tuberculosis.
2763	October 16, 1907	do.	R.H.	Killed 79 days	No tuberculosis.
2764			L.F.	Killed 79 days	No tuberculosis.
2765			L.F.	Killed 79 days	G.T. No disease of omentum. ? spontaneous tuberculosis.
2766			L.H.	Killed 79 days	No tuberculosis.
2767			L.H.	Killed 79 days	No tuberculosis.
2768			R.F.	Killed 79 days	No tuberculosis.
2769			R.F.	Died 77 days	No tuberculosis.
2770			R.H.	Killed 79 days	No tuberculosis.
2771	October 17, 1907	do.	R.H.	Killed 79 days	No tuberculosis.
2772			L.F.	Killed 79 days	No tuberculosis.
2773			L.F.	Killed 79 days	No tuberculosis.
2774			L.H.	Killed 79 days	No tuberculosis.
2775			L.H.	Killed 79 days	No tuberculosis.
2776			R.F.	Killed 78 days	No tuberculosis.
2777			R.F.	Killed 78 days	No tuberculosis.
2778			R.H.	Killed 78 days	No tuberculosis.
2779	October 18, 1907	do.	R.H.	Killed 78 days	No tuberculosis.
2780			L.F.	Killed 78 days	No tuberculosis.
2781			L.F.	Killed 78 days	No tuberculosis.
2782			L.H.	Killed 78 days	No tuberculosis.
2783			L.H.	Killed 78 days	No tuberculosis.
2787			R.F.	Killed 47 days	No tuberculosis.
2788	October 19, 1907	do.	R.F.	Died 46 days	G.T. Omentum thickened.
2789			B.H.	Killed 79 days	No tuberculosis.
2790			R.H.	Killed 47 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW B—*continued.*

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
2791	October 19, 1907	10·0 cc. of milk plus the deposit of 20·0 cc. obtained by the centrifuge.	L.F.	Killed 79 days	No tuberculosis.
2792			L.F.	Killed 47 days	No tuberculosis.
2793			L.H.	Killed 79 days	No tuberculosis.
2794			L.H.	Killed 47 days	No tuberculosis.
MILK WITHDRAWN AFTER THE INOCULATION OF COW WITH TUBERCULIN.					
2882	November 6, 1907	do.	R.F.	Killed 63 days	No tuberculosis.
2883			R.F.	Killed 63 days	No tuberculosis.
2884			R.H.	Died 39 days	G.T. Omentum thickened by fibro-caseous nodules.
2885			R.H.	Killed 63 days	No tuberculosis.
2886			L.F.	Killed 63 days	No tuberculosis.
2887			L.F.	Killed 63 days	G.T.
2888			L.H.	Killed 63 days	G.T.
2889			L.H.	Killed 63 days	G.T.
2890			R.F.	Killed 62 days	Early G.T.
2891			R.F.	Killed 62 days	Early G.T.
2892			R.H.	Killed 62 days	No tuberculosis.
2893			R.H.	Died 19 days	A few tubercles in omentum containing tubercle bacilli.
2894	November 7, 1907	do.	L.F.	Killed 62 days	G.T.
2895			L.F.	Killed 62 days	G.T.
2896			L.H.	Killed 62 days	Caseation of inguinal gland with T.B. No local lesion seen.
2897			L.H.	Killed 62 days	Early G.T.

MILK OF COW B WITHDRAWN IN THE ORDINARY WAY: UDDER CLEANSED.

Number.	Date of Inoculation.	Dose in each case.	—	Duration of Life.	Result.
2874	November 4, 1907	10·0 cc. of milk plus the deposit of 48·0 cc. obtained by the centrifuge.	Mixed milk	Killed 65 days	G.T. severe.
2875				Killed 65 days	G.T. severe.
2876				Killed 65 days	No tuberculosis.
2877				Died 10 days	No tuberculosis.

MILK OF COW B WITHDRAWN IN THE ORDINARY WAY: UDDER UNCLEANSED.

Number.	Date of Inoculation.	Dose in each case.	—	Duration of Life.	Result.
2878	November 5, 1907	10·0 cc. of milk plus the deposit of 48·0 cc. obtained by the centrifuge.	Mixed milk	Killed 64 days	Early G.T.
2879				Killed 64 days	Early G.T.
2880				Killed 64 days	No tuberculosis.
2881				Killed 64 days	No tuberculosis.

PIG 212.

Fed with the faeces of Cow B from October 1, 1907, to October 9, 1907.

Dose—One-fourth part of 19·11 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—January 3, 1908. [94 days after feeding began.]

Weights.

			qrs.	lbs.
October 1, 1907 ...	...	...	1	4
January 3, 1908	...	...	2	23

Gain in weight.—1 qr. 19 lbs.

Tuberculin Tests.—September 16, 1907. [15 days before the experiment began.] Reaction : Negative. November 28, 1907. [58 days after the experiment began.] Reaction : Positive. Rise of temperature 2·6° Centigrade.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue, Pharynx, and Larynx.—Normal.

Tonsils.—Each tonsil contained two or three firm congested patches up to 1 cm. in area beset with caseous foci.

On the Left Side of the Neck extending from the angle of the jaw to the root of the ear there was a chain of glands, the most anterior of which was the largest and measured 5·0 by 4·0 by 2·5 cm. On section it consisted of firm grey tissue with a close network of yellowish caseated tissue. At one extremity there was a caseous gritty nodule which easily shelled out. The next gland measuring 4·0 by 2·0 cm. was firm and grey with an early caseous network. Of the rest of the glands, one was filled with a caseous network, another contained caseous foci and several small glands were normal. On the right side of the neck the most anterior gland measured 6·0 by 4·0 by 2·5 cm.; on section it consisted of firm grey tissue extensively replaced by a caseous gritty network. Of the other lymphatic glands two were moderately enlarged and closely beset with small caseous patches.

The Left Prescapular Gland showed a minute opaque focus.

The Right Prescapular Gland and Cervical Glands were normal.

Abdomen.

Omentum.—Normal.

Peritoneum.—On the peritoneal surface of the diaphragm on the right side there were some flattened

grey nodules where the liver had been in contact with it.

Stomach and Intestines.—Normal.

Mesenteric Glands.—Several of the mesenteric glands were a little enlarged and contained softening caseous nodules which easily shelled out; in the rest of the mesenteric glands there were occasionally found small collections of caseous tubercles.

Spleen.—The spleen contained about a dozen grey nodules, caseous in the centre, varying from a millet seed up to a large pea in size.

Liver.—On the surface of the liver beneath the capsule there were moderately numerous irregular grey nodules, with opaque caseous centres, varying from about 0·5 mm. to 2·0 mm. in diameter, those nearest to the surface had attached to them fibrinous fringes. On section similar nodules were evenly distributed throughout the substance.

Portal Glands.—The portal glands were enlarged and consisted of firm grey tissue beset with caseating streaks and foci.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Coeliac Glands.—The coeliac glands were firm and beset with irregular caseous patches and foci.

Lumbar and Iliac Glands.—Normal.

Thorax.

Pleura.—On the pleural surface of the diaphragm there were two loosely attached fibrous growths.

Lungs.—In the lungs were scattered grey translucent nodules, with opaque caseous centres, the majority varying between a rape seed and a hemp seed in size; in the anterior lobes of each lung, however, there were several congested nodules beset with caseous foci up to 6·0 mm. in diameter; the nodules were situated mainly just beneath the pleura.

Dorsal Mediastinal Glands.—Normal.

The Bronchial Glands on each side although very little enlarged were beset with caseous foci.

Inguinal and Precrural Glands normal.

PIG 214.

Fed with the faeces of Cow B from October 1, 1907, to October 9, 1907.

Dose—One-fourth part of 19·11 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—December 3, 1907. [63 days after the experiment began.]

Weights.

			qrs.	lbs.
October 1, 1907 ...	...	...	1	8
December 3, 1907	...	...	2	0

Gain in weight.—20 lbs.

Tuberculin Tests.—September 16, 1907. [15 days before the experiment began.] No reaction.

November 28, 1907. [58 days after the experiment began.] Positive reaction. Rise of temperature 3·0° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Tongue, Larynx, and Pharynx.—Normal.

Right Tonsil.—Normal.

In the Left Tonsil there was an ulcer 5·0 mm. in diameter with thin irregular undermined edges and base covered with a little whitish substance.

On the Left Side of the Neck, four of the glands below and posterior to the angle of the jaw, were

enlarged varying in size from a sparrow's egg up to a pheasant's egg. On section they were composed throughout of firm pinkish caseo-necrotic tissue with fine yellowish gritty streaks. Three small glands were not affected.

Cervical Glands.—The left cervical glands were slightly enlarged and showed discrete irregular caseous tubercles.

The right cervical glands were normal.

Prescapular Glands.—The left prescapular gland was about twice the normal and was firm, grey and beset with irregular caseous tubercles.

The right prescapular gland was normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were not obviously enlarged. One gland in the centre had part of its substance a little prominent and firm, showing early caseous patches in the cortex.

Colic Glands.—Normal.

Spleen.—In the spleen there were two caseating nodules the size of hemp seeds and three minute opaque tubercles.

Liver.—On the convex surface of the liver there were ten tubercles and six on the concave, varying in size up to a millet seed. On section they consisted of

grey translucent tissue with caseous centres. Similar tubercles were sparsely scattered throughout the substance.

Portal Glands.—In the cortices of the portal glands there were scattered irregular early caseous patches.

Kidneys.—One kidney showed a few minute grey points. The other was normal.

Suprarenal Bodies.—Normal.

Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Lungs.—The lungs were pink and crepitant. In the anterior and middle lobes of the right there were 18 nodules varying from a rape seed up to 5·0 mm. in diameter. On section they consisted of grey tissue caseated in the centre. There were similar nodules scattered throughout the left anterior and the caudal lobes, one of which attained the size of a pea.

Bronchial Glands.—They were beset with small discrete early caseous patches.

Inguinal and Precrural Glands.—Normal.

Testes.—Normal.

Microscopical Examination.

(Smear preparation.)

Left Tonsil.—No tubercle bacilli. Moderately numerous blue stained organisms.

PIG 216.

Fed with the faeces of Cow B from October 1, 1907, to October 9, 1907.

Dose—One-fourth part of 19·11 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—January 9, 1908. [100 days after feeding began.]

	Weights.		
	qrs. lbs.		
October 1, 1907	... ... ... 1 8		
January 9, 1908	... ... ... 3 7		

Gain in weight.—1 qr. 27 lbs.

Tuberculin Tests.—September 16, 1907. [15 days before the experiment began.] Reaction: Negative.

November 28, 1907. [58 days after the experiment began.] Reaction: Positive. Rise of temperature 2·1° Centigrade.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue.—Normal.

Tonsils.—Normal.

Pharynx.—Normal.

Submaxillary Glands.—On the left side of the neck beneath the jaw, the gland situated most anteriorly was the size of a pigeon's egg, and on section was about three quarters replaced by caseous gritty tissue. All the other glands about the jaw on each side of the neck were normal.

Pharyngeal, Cervical, and Prescapular Glands.—Normal.

Abdomen.

Peritoneum.—Normal.

Omentum.—In the omentum there were about four dozen discrete spherical nodules from a rape seed up to 4·0 mm. in diameter. On section they were translucent with yellow caseous centres.

Stomach.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Several of the mesenteric glands at each extremity and three glands in the middle of

the mesentery were enlarged and the cortices extensively replaced by yellowish caseous substance, just perceptibly gritty. One gland at one extremity measured 3·0 by 1·5 cm. and was entirely replaced by a pinkish yellow caseo-necrotic substance. Many glands appeared normal; the remainder showing discrete yellow nodules and foci.

Ileo-Colic Glands.—The ileo-colic glands were extensively affected containing numerous yellow caseous nodules.

Colic Glands.—Several showed foci and small nodules.

Spleen.—The spleen showed a dozen nodules up to 5·0 mm. in diameter, two of them being on the surface; the rest could be seen beneath the capsule slightly projecting from the surface. All of them were grey and translucent with irregular yellow caseous centres.

Liver.—There could be seen just beneath the surface of the liver about two hundred and seventy nodules ranging from a point up to 5·0 mm. in diameter; the smallest were grey and translucent throughout, the larger ones were grey with caseous centres or beset with caseous foci. On section the substance contained numerous similar nodules chiefly about 2·5 mm. in diameter.

Portal Glands.—The portal glands were enlarged and they showed their cortices closely beset with large irregular yellow caseous nodules.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

The Renal and Lumbar Glands.—The renal and lumbar glands were enlarged (the largest and most severely affected being on the left side of the spine), and showed numerous irregular yellow caseous foci, which in places had run together forming large nodules with a caseous network, just perceptibly gritty.

Iliac Glands.—Two left iliac glands showed a few minute caseous foci.

Right Iliac Glands.—Normal.

Coeliac Glands.—(Seven in number), four were enlarged and showed fairly numerous yellow irregular caseous nodules up to 3 and 4 mm. in diameter; the rest appeared normal.

Thorax.

Diaphragm.—On the peritoneal surface of the central tendon of the diaphragm, mainly on the right side, there were two dozen nodules up to about 6·0 mm. in diameter, many of which extended through the diaphragm and formed nodules on the pleural surface; they were grey and translucent and beset with yellow caseous foci. There were two similar nodules on the right pleura.

Lungs.—The lungs were pink and crepitant, they showed on the surface about one hundred and fifty

nodules up to 5·0 and 6·0 mm. in diameter; the smallest were grey with opaque centres; the largest were considerably caseated and gritty. In each of the anterior and middle lobes there was a single nodule, from 0·8 to 1·0 cm. in diameter, they were grey and translucent with a fine caseous network. On section the lung parenchyma showed moderately numerous similar nodules.

Thoracic Lymphatic Glands.

The Bronchial and Mediastinal Glands were enlarged and showed their cortices closely beset with yellow caseating nodules in places forming a coarse network.

Pericardium.—Normal.

Heart.—Normal.

Inguinal Glands.—One on the left side contained a small irregular yellow caseous nodule; other inguinal and precrural glands normal.

PIG 218.

Fed with the faeces of Cow B from October 1, 1907, to October 9, 1907.

Dose—One-fourth part of 19·11 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—December 11, 1907. [71 days after the experiment began.]

Weights.

			qrs.	lbs.
October 1, 1907 ...	...	...	1	7
December 11, 1907	...	...	2	7

Gain in weight.—1 qr. 0 lbs.

Tuberculin Tests.—September 16, 1907. [15 days before the experiment began.] No reaction.

November 28, 1907. [58 days after the experiment began.] Positive reaction. Rise of temperature 1·3° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

On the Right Side beneath the Jaw anterior to the submaxillary salivary gland there was a gland measuring 3·3 by 2·5 by 1·3 cm. On section the substance was firm, translucent and more than half replaced by a pinkish caseous gritty nodule and with discrete tubercles in the remaining part.

A second smaller gland contained a caseous network.

The glands posterior to the salivary gland were normal.

Left Submaxillary Gland.—Normal.

Cervical and Prescapular Glands.—Normal.

Abdomen.

Stomach.—Normal.

Intestines.—Normal.

Omentum.—Normal.

Peritoneum.—Normal.

Mesenteric Glands.—In one mesenteric gland there was a caseating nodule 3·0 mm. in diameter, there was a slightly larger irregular nodule in a second. A third gland showed part of its substance replaced by a caseous network and a fourth gland was slightly enlarged at one extremity and contained an irregular waxy caseating nodule 1·0 cm. in diameter.

Spleen.—Normal.

Liver.—On the surface beneath the capsule of the liver there were eight grey tubercles with opaque centres up to a rapé seed in size. On section through the substance an occasional grey tubercle was seen.

Portal Glands.—In the portal glands there were a few caseous foci.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar and Iliac Glands.—Normal.

Thorax.

Lungs.—The left lung showed on the surface beneath the pleura, two grey submiliary tubercles with opaque centres. In the right there were three similar tubercles.

Bronchial Glands.—There was a caseous focus in a left bronchial gland. The right bronchial gland was normal.

Mediastinal Glands.—Normal.

Inguinal and Pre-crural Glands.—Normal.

PIG 222.

Fed once with the milk from Cow B.

Date—November 1, 1907.

Dose—2,870 cubic centimetres.

Age—11 weeks.

Killed in good health—January 9, 1908. [69 days after the experiment began.]

Weights.

			qrs.	lbs.
November 1, 1907 ...	...	...	1	14
January 9, 1908	...	...	2	26

Gain in weight.—1 qr. 12 lbs.

Tuberculin Tests.—October 11, 1907. [20 days before the experiment began.] No reaction.

November 28, 1907. [27 days after the experiment began.] No reaction.

POST-MORTEM EXAMINATION.

General Condition.—Good.

There was no sign of tuberculosis.

PIG 224.

Fed with the milk of Cow B from October 14, 1907, to October 20, 1907.

Dose one-half part of 18,490 cubic centimetres.

Age—9 weeks.

Killed in good health—January 8, 1908. [86 days after the experiment began.]

Weights.				November 28, 1907. [45 days after the experiment began.] Reaction : Negative.
		qrs.	lbs.	
October 14, 1907	1 0
January 8, 1908	2 6
<i>Gain in weight.</i> —1 qr. 6 lbs.				
<i>Tuberculin Tests.</i> —October 11, 1907. [3 days before experiment began.] Reaction : Negative.				

POST-MORTEM EXAMINATION.

General Condition.—Good.

There was no sign of tuberculosis.

PIG 226.

Fed with the milk of Cow B from October 14, 1907, to October 20, 1907.

Dose—One-half part of 18,490 cubic centimetres.

Age—9 weeks.

Killed in good health—January 8, 1908. [86 days after the experiment began.]

Weights.				November 28, 1907. [45 days after the experiment began.] No reaction.
		qrs.	lbs.	
October 14, 1907	1 5
January 8, 1908	2 0
<i>Gain in weight.</i> —23 lbs.				
<i>Tuberculin Tests.</i> —October 11, 1907. [3 days before the experiment began.] No reaction.				

POST-MORTEM EXAMINATION

General Condition.—Good.

There was no sign of tuberculosis.

JERSEY COW C.

POST-MORTEM EXAMINATION.

Body emaciated.

Thorax.

Pleura.—On the pleura along the ribs there were numerous flattened fibro-caseous nodules up to 2·0 cm., some loosely attached. There were numerous similar nodules on the pleura over the dorsal mediastinal glands. On the pleural surface of diaphragm there were a few small loosely attached fibro-caseous nodules.

Lungs.—The lungs were very heavy and voluminous. On the pleural surfaces there were numerous flattened perlucht growths similar to but larger than those on the parietal pleura varying up to 4·0 cm. in diameter. In both anterior lobes there were large caseo-necrotic masses replacing a third of the substance, the rest of the anterior lobes was closely beset with nodules and masses varying in size. The posterior lobes were similarly severely affected. On section the masses were bright yellow, caseo-necrotic and in many parts becoming soft and caseo-purulent around the margins. The bronchi were filled with muco-pus and in several places caseous substance could be seen protruding into the cavity of a bronchus.

There was a cast of the trachea formed of inspissated muco-pus.

Mediastinal Glands.—The long mediastinal gland weighed 2 lbs. and measured 26·0 by 10·0 by 6·0 cm. On section it consisted almost throughout of bright yellow caseo-necrotic substance.

Bronchial Glands.—The bronchial glands were similarly greatly enlarged and caseo-necrotic throughout.

Other mediastinal and supra-bronchial glands were similar.

Heart and Great vessels.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—All the Peyer's patches of the small intestine contained a few caseous nodules varying from a millet seed up to a hemp seed, many of them ulcerated on the surface. In addition there were several small ulcers 5·0 mm. in diameter from which the caseous substance had almost disappeared.

Mesenteric Glands.—The majority of the mesenteric glands appeared normal; several contained discrete caseous nodules and a few at one extremity showed the cortices diffusely caseous. One mesenteric gland about the centre of the mesentery was greatly enlarged measuring 8·0 by 4·0 by 5·5 cm., on section it consisted practically throughout of an orange yellow caseo-necrotic slightly gritty substance.

Spleen.—Weighed 1 lb. 6 ozs. On section it contained ten caseous gritty tubercles varying from a rape seed up to a millet seed in size.

Liver.—Anterior surface normal. On the postero-inferior surface there was a single caseous tubercle. On section through the substance three caseous foci were met with, of which one was gritty.

Gall Bladder.—Normal.

Portal Glands.—The portal glands contained a few discrete caseous nodules, the size of hemp seed.

Kidneys.—Both kidneys showed in the cortices just beneath the surface scattered tubercles varying from a rape seed up to a hemp seed in size; they were all caseous and the largest slightly gritty. On section similar nodules were found scattered throughout the deeper parts of the cortices.

Suprarenal Bodies.—The left suprarenal body contained ten, and the right five, caseo-calcareous nodules from a rape seed up to 3·5 mm. in diameter.

Lumbar and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, Pharynx, and Trachea.—Normal.

Uterus.—The walls of both cornua of the uterus and also the common portion were thickened and infiltrated with a network of grey nodules with bright

yellow caseous centres. The cavity was filled with purulent fluid and caseous flocculi.

Supramammary Glands.—Each supramammary gland showed a minute caseous focus; one contained also a grey nodule the size of a hemp seed, diffusely caseous.

The Udder.—Normal.

Retro-Pharyngeal Glands.—The left was congested and showed a number of caseo-calcareous masses arranged around the cortex. The right contained two caseous miliary tubercles.

Cervical Glands.—The right inferior cervical gland was enlarged and about three-quarters of the cortex

was replaced by yellow caseo-calcareous masses; other cervical glands were normal.

Parotid, Prepectoral, Prescapular, Precrural, Axillary, Popliteal, and Gluteal Glands.—Normal.

Microscopical Examination.

(Smear preparations.)

Supramammary Gland (focus).—(1) Three tubercle bacilli.

Supramammary Gland (focus).—(2) Two tubercle bacilli.

Intestine (ulcer).—A moderate number of tubercle bacilli.

Bronchial Gland.—No tubercle bacilli.

GUINEA-PIGS INOCULATED WITH THE FAECES OF COW C.

Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2805		.05 cc.	Ip.	Killed 22 days	G.T.
2806		.1 cc.	Ip.	Killed 18 days	G.T.
2807	October 24, 1907	.1 cc.	Sub.	Killed 16 days	No tuberculosis; discharging ulcers in the skin.
2808		.05 cc.	Ip.	Died 4 days	No tuberculosis.
2809		.05 cc.	Sub.	Killed 32 days	Early G.T.
2810		.05 cc.	Sub. & Ip.	Killed 32 days	G.T. severe.
2813		.05 cc.	Ip.	Killed 21 days	G.T.
2814		.1 cc.	Ip.	Killed 20 days	G.T. severe.
2815	October 25, 1907	.2 cc.	Ip.	Killed 17 days	Single nodule in omentum; two nodules in spleen; portal gland caseous.
2816		.1 cc.	Sub.	Killed 34 days	G.T. severe.
2817		.1 cc.	Sub.	Killed 34 days	G.T.
2818		.2 cc.	Sub.	Killed 20 days	No tuberculosis; ulcer in skin; no T.B.
2829		1.0 cc.	Sub.	Killed 17 days	No tuberculosis. Large ulcer in skin.
2830		.3 cc.	Ip.	Killed 29 days	G.T. severe.
2831	October 28, 1907	.1 cc.	Sub.	Killed 66 days	G.T. severe.
2832		.2 cc.	Sub.	Died 66 days	G.T. severe.
2833		.2 cc.	Ip.	Died 1 day	Acute infection. No T.
2834		.1 cc.	Ip.	Killed 18 days	Early G.T.
2837		.1 cc.	Ip.	Killed 28 days	G.T.
2838		.2 cc.	Ip.	Killed 28 days	G.T.
2839	October 29, 1907	.3 cc.	Ip.	Died 1 day	Acute infection. No T.
2840		.1 cc.	Sub.	Killed 30 days	G.T.
2841		.3 cc.	Sub.	Died 3 days	No tuberculosis.
2842		1.0 cc.	Sub.	Died 2 days	No tuberculosis.
2853		.2 cc.	Ip.	Died 1 day	Acute infection. No T.
2854		.2 cc.	Ip.	Died 1 day	Acute infection. No T.
2855	October 30, 1907	.2 cc.	Ip.	Killed 27 days	G.T.
2856		1.0 cc.	Sub.	Died 5 days	No tuberculosis.
2857		1.0 cc.	Sub.	Died 2 days	No tuberculosis.
2858		1.0 cc.	Sub.	Died 2 days	No tuberculosis.

Ip. = intraperitoneal.

Sub. = subcutaneous.

GUINEA-PIGS INOCULATED WITH FAECES OF COW C.

DILUTED WITH SALT SOLUTION; 1 GRAMME OF FAECES IN 2,000 CUBIC CENTIMETRES OF STERILE SALT SOLUTION.

Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2872	October 31, 1907	1·0 cc.	Ip.	Died 63 days	Severe G.T.
2873		2·0 cc.	Ip.	Killed 63 days	Severe G.T.

GUINEA-PIGS FED WITH FAECES OF COW C.

DOSE IN EACH CASE 1·0 CC. OF FAECAL EMULSION.

Number.	Date of Feeding.	Duration of Life.	Result.
2803	October 24, 1907	Killed 90 days	No tuberculosis.
2804			
2811	October 25, 1907	Killed 89 days	No tuberculosis.
2812			
2827	October 28, 1907	Died 44 days	No tuberculosis.
2828			
2835	October 29, 1907	Killed 86 days	No tuberculosis.
2836			
2851	October 30, 1907	Killed 85 days	No tuberculosis.
2852			

GUINEA-PIGS FED CONTINUOUSLY WITH FAECES OF COW C MIXED WITH STERILIZED MILK.

Number.	Date of Feeding.	Duration of Life.	Result.
2799		Killed 74 days	No tuberculosis.
2800	From October 24, 1907, to October 30, 1907.	Killed 90 days	Caseous ulcers in intestine, and caseation of mesenteric glands. G.T.
2801		Died 48 days	No tuberculosis.
2802		Killed 90 days	No tuberculosis.

ANIMALS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW C.

Number of Animal.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
Rabbit 1524			R.F.	Died 13 days	No tuberculosis.
Rabbit 1525	October 25, 1907.	30·0 cc.	R.H.	Killed 76 days	No tuberculosis.
Rabbit 1526			L.F.	Died 18 days	No tuberculosis.
Rabbit 1527			L.H.	Killed 76 days	No tuberculosis.
Guineapig 2819			R.F.	Died 50 days	No tuberculosis.
Guineapig 2820			R.F.	Killed 73 days	No tuberculosis.
Guineapig 2821			R.H.	Killed 73 days	No tuberculosis.
Guineapig 2822	October 25, 1907.	10·0 cc. of milk plus the deposit of 40·0 cc. obtained by centrifuging.	R.H.	Killed 73 days	No tuberculosis.
Guineapig 2823			L.F.	Killed 73 days	No tuberculosis.
Guineapig 2824			L.F.	Killed 73 days	No tuberculosis.
Guineapig 2825			L.H.	Killed 73 days	No tuberculosis.
Guineapig 2826			L.H.	Died 63 days	No tuberculosis.

ANIMALS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW C—*continued.*

Number of Animal.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
Rabbit 1531			R.F.	Killed 72 days	No tuberculosis.
Rabbit 1532	October 29, 1907.	50·0 cc.	L.F.	Died 3 days	No tuberculosis.
Rabbit 1533			L.H.	Killed 72 days	No tuberculosis.
Guineapig 2843			R.F.	Died 48 days	Three transparent tubercles in omentum containing tubercle bacilli.
Guineapig 2844			R.F.	Killed 71 days	No tuberculosis.
Guineapig 2845			R.H.	Killed 69 days	No tuberculosis.
Guineapig 2846			R.H.	Killed 71 days	No tuberculosis.
Guineapig 2847	October 29, 1907	As on Oct. 25.	L.F.	Died 24 days	Three transparent tubercles in omentum containing moderately numerous tubercle bacilli.
Guineapig 2848			L.F.	Killed 71 days	No tuberculosis.
Guineapig 2849			L.H.	Killed 69 days	No tuberculosis.
Guineapig 2850			L.H.	Killed 71 days	No tuberculosis.
Rabbit 1534			R.F.	Died 25 days	Six transparent tubercles in omentum containing moderately numerous T.B.
Rabbit 1535	October 30, 1907.	30·0 cc.	R.H.	Died 27 days	Several tubercles in omentum, one caseating, containing T.B.
Rabbit 1536			L.F.	Killed 71 days	No tuberculosis.
Rabbit 1537			L.H.	Killed 71 days	Three miliary tubercles and one caseating nodule (6·0 mm.) in omentum. Caseation of portal glands. Four caseating nodules in the lungs.
Guineapig 2859			R.F.	Killed 71 days	G.T. Omentum contained about fifty nodules.
Guineapig 2860			R.F.	Killed 71 days	Severe G.T.
Guineapig 2861			R.H.	Killed 68 days	Early G.T.
Guineapig 2862	October 30, 1907.	As on Oct. 25.	R.H.	Killed 71 days	Severe G.T.
Guineapig 2863			L.F.	Killed 68 days	No tuberculosis.
Guineapig 2864			L.F.	Killed 71 days	No tuberculosis.
Guineapig 2865			L.H.	Killed 68 days	No tuberculosis.
Guineapig 2866			L.H.	Killed 71 days	No tuberculosis.

PIG 230.

Fed with the faeces of Cow C from October 23, 1907, to October 30, 1907.

Dose—5·56 kilogrammes of faeces.

Age—10 weeks.

Killed when in good health—December 11, 1907. [48 days after the experiment began.]

Weights.

			qrs.	lbs.
October 23, 1907	...	...	1	11
December 11, 1907	...	...	2	7

Gain in weight.—24 lbs.

Tuberculin Tests.—October 11, 1907. [12 days before the experiment began.] No reaction.

November 28, 1907. [36 days after the experiment began.] Positive reaction. Rise of temperature 1·5° Centigrade.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue, Pharynx, and Larynx.—Normal.

Tonsils.—In the tonsils there were a few soft yellowish foci.

On the Left Side of the Neck, beneath the angle of the jaw, anterior to the submaxillary salivary gland, there was a gland measuring 5·0 by 3·0 by 2·2 cm. On section it was composed of firm translucent tissue

with a close yellowish network ; attached to it was a small gland containing a few opaque foci.

Four glands posterior to the first were normal.

On the Right Side of the Neck, in front of the submaxillary salivary gland, there were two glands forming a mass 5·0 by 3·3 by 2·0 cm. On section it resembled that on the opposite side ; the other glands about the jaw were normal.

Cervical Glands.—Normal.

Prescapular Glands.—Normal.

Abdomen.

Stomach.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands were normal. About six glands on each side of the mesentery in the centre were moderately enlarged, consisting of firm translucent tissue with a firm yellowish waxy caseous network.

Spleen.—Normal.

Liver.—On the convex surface of the liver there were visible beneath the capsule twenty slightly

irregular grey caseating tubercles the size of rape seeds ; they were sparsely scattered on the other surfaces and in the substance.

Portal Glands.—One portal gland was a little firm at one extremity and showed early caseous patches. A second small gland was similar.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Coeliac, Lumbar, and Iliac Lymphatic Glands.—Normal.

Thorax.

Lungs.—In the left lung on the surface beneath the pleura there were fourteen grey caseating tubercles up to a millet seed in size. The right lung showed rather fewer. On section no more could be seen.

Bronchial Glands.—Normal.

Precrural and Inguinal Glands.—Normal.

Microscopical Examination.

(Smear preparation.)

Tonsil (focus).—Four tubercle bacilli seen.

COW F.

POST-MORTEM EXAMINATION.

General Condition.—Poor.

Tongue.—Normal.

Tonsils.—The tonsils were firm and on section contained caseous nodules.

Submaxillary Glands.—Normal.

Pharyngeal Glands.—The left posterior pharyngeal gland measured 9·5 by 5·5 by 3·0 cm. and on section was caseous throughout.

The right posterior pharyngeal gland measured 7 by 3·5 cm. On section the superficial part of the cortex was caseous.

Cervical Glands.—Several of the cervical glands contained large nodules, some caseous throughout.

Abdomen.

Intestines.—In the small intestine there were counted nineteen ulcers, varying up to 4·0 cm. in diameter ; the bases and the raised margins were firm and caseating. There were also scattered nodules in both intestines.

Mesenteric Glands.—The mesenteric glands were enormously enlarged and replaced by a brownish yellow necrotic substance, in many parts softening. In points of size and appearance the lesions were older than those in the bronchial glands ; also the tuberculosis of the lungs was fairly acute.

Spleen.—The spleen appeared normal.

Liver.—On the surface of the liver there was a single small tubercle ; the parenchyma was beset throughout with small ill-defined yellowish grey necrotic patches.

Portal Glands.—The cortices of the portal glands were a little firm, but showed no caseation.

Kidneys.—In the medulla of the right kidney there were two caseating miliary tubercles. Left kidney normal.

Suprarenal Bodies.—The left suprarenal body contained three caseous nodules up to a pea in size.

Right suprarenal body showed three similar nodules up to the size of a millet seed.

There was an opaque focus in one renal lymphatic gland.

Lumbar Glands.—Five lumbar glands, up to a pigeon's egg in size, caseous throughout.

Iliac Glands.—Caseo-calcareous nodules in two iliac glands.

Thorax.

Lungs.—The lungs were voluminous, the anterior lobes were congested. The substance was closely beset throughout with irregular and for the most part small caseous nodules and patches. On the left lung there was a number of perlucht nodules and also numerous similar nodules and masses on the parietal pleura.

Prescapular Glands were not tuberculous. The right gland was enlarged from the tuberculin inoculation.

Prepectoral and Axillary Glands.—Normal.

Supramammary Lymphatic Glands.—Both supramammary glands were enlarged and contained dirty yellow caseo-necrotic masses.

Udder.—In the tissue of the udder of the left hind quarter forming the wall of the main sinus close to the teat, there were four firm reddish grey nodules varying from a millet seed up to a pea ; they resembled the tissue around, being distinguished by a central caseous streak and firmness from the tissue in that part of the udder which is mainly composed of ducts. The other quarters of the udder were normal.

Uterus.—In the horns of the uterus there were rounded yellow caseo-necrotic nodules, not unlike unopened mushrooms, projecting into the cavities and loosely attached by pedicles, composed of reddish grey tissue of which the centres of the nodules were also formed ; the largest was the size of a robin's egg. There was a muco-purulent exudation in the uterus and vagina.

Microscopical Examination.

(Smear preparations.)

Udder (nodule I and II).—Showed moderately numerous tubercle bacilli.

GUINEA-PIGS WITH FAECES OF COW F.

ALL INTRAPERITONEAL.

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
2979		1·0 cc.	Died 1 day	Acute infection.
2980		1·0 cc.	Died 1 day	Acute infection.
2981		·5 cc.	Died 11 days	Sub-acute infection.
2982	January 29, 1908	·5 cc.	Killed 33 days	General tuberculosis.
2983		·5 cc.	Died 8 days	No tuberculosis.
2984		·5 cc.	Killed 33 days	General tuberculosis.
2985		·5 cc.	Killed 33 days	General tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW F.

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
2971			R.F.	Died 35 days	Caseo-purulent nodule in muscle at site of inoculation; caseation of sternal gland. Numerous T.B. in both.
2972			R.F.	Died 11 days	No tuberculosis.
2973		6·0 cc. of milk plus the deposit of 24·0 cc. obtained by the centrifuge.	R.H.	Died 18 days	General tuberculosis.
2974	January 29, 1908		R.H.	Died 24 days	General tuberculosis.
2975			L.F.	Died 27 days	General tuberculosis.
2976			L.F.	Died 35 days	General tuberculosis.
2977			L.H.	Died 18 days	General tuberculosis.
2978			L.H.	Died 18 days	General tuberculosis.
2986		5·0 cc. plus the deposit of 10 cc.	R.F.	Killed 34 days	General tuberculosis.
2987			R.F.	Killed 34 days	General tuberculosis.
2988			R.H.	Died 17 days	General tuberculosis.
2989	January 30, 1908		R.H.	Died 7 days	No tuberculosis.
2990		As in the first series.	L.F.	Died 10 days	No tuberculosis.
2991			L.F.	Killed 34 days	General tuberculosis.
2992			L.H.	Died 17 days	General tuberculosis.
2993			L.H.	Died 4 days	No tuberculosis.
2994		7·0 cc.	R.F.	Killed 33 days	General tuberculosis.
2995		7·0 cc.	R.F.	Killed 33 days	General tuberculosis.
2996			R.H.	Died 23 days	General tuberculosis.
2997	January 31, 1908		R.H.	Died 9 days	One minute tubercle in omentum. Tubercle bacilli found.
2998		As in the first series.	L.F.	Died 6 days	No tuberculosis.
2999			L.F.	Killed 33 days	General tuberculosis.
3000			L.H.	Died 18 days	General tuberculosis.
3001			L.H.	Died 8 days	No tuberculosis.
3002		4·0 cc.	R.F.	Killed 32 days	General tuberculosis.
3003			R.H.	Died 8 days	No tuberculosis.
3004			R.H.	Died 7 days	No tuberculosis.
3005	February 1, 1908	10·0 cc.	L.F.	Killed 32 days	General tuberculosis.
3006			L.F.	Died 8 days	No tuberculosis.
3007			L.H.	Died 3 days	No tuberculosis.
3008			L.H.	Died 22 days	General tuberculosis.

SHORTHORN HEIFER A.

POST-MORTEM EXAMINATION.

General Condition.—Good.*Tongue.*—Normal.*Tonsils.*—Normal.*Pharynx.*—Normal.*Submaxillary Glands.*—Normal.

Pharyngeal Glands.—The right retro-pharyngeal gland measured 10·5 by 6·5 by 5·0 cm. On section it was a cyst with thick fibrous walls, filled with caseo-necrotic substance which was partly broken down into a brownish yellow purulent fluid with caseous flakes and partly adherent as congested caseo-necrotic masses to the internal walls.

The left retro-pharyngeal gland measured 4·1 by 3·0 by 1·5 cm. On section it was normal.

Cervical Glands.—Normal.*Abdomen.**Peritoneum and Omentum.*—Normal.

Intestines.—In the Peyer's patches of the small intestine there were five nodules, two grey with opaque foci, and three soft yellow and caseous, varying up to about a millet seed in size.

There was also a small ulcer with a fibrous slightly opaque thickened base in which no tubercle bacilli could be demonstrated microscopically.

Large Intestine.—Normal.

Mesenteric Glands.—One mesenteric gland showed a yellow caseo-calcareous nodule nearly 1·0 cm. in diameter.

Spleen.—Normal.*Liver.*—Normal.*Portal Glands.*—Normal.*Kidneys.*—Normal.*Suprarenal Bodies.*—Normal.

Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands.—Normal.

*Thorax.**Pleura.*—Normal.

Lungs.—In the lungs just beneath the pleura there were three translucent foci and a soft grey nodule the size of a hemp seed.

Bronchial and Mediastinal Glands.—Normal.*Heart and Pericardium.*—Normal.

Gluteal Glands.—The right was larger than the left, measuring 2·5 by 2·0 cm. On section the substance was firm and infiltrated almost throughout, with a bright yellow caseo-necrotic network mottled with patches of haemorrhage. The left gluteal gland was normal.

Various Lymphatic Glands.

Parotid, Prescapular, Prepectoral, Precrural, and Popliteal Glands.—Normal.

Udder.—Normal.*Supramammary Glands.*—Normal.*Microscopical Examinations.*

(Smear preparations.)

Intestine (grey nodule).—One tubercle bacillus.*Intestine (caseous nodule).*—No tubercle bacilli.*Intestine (ulcer).*—No tubercle bacilli.

Retro-pharyngeal Gland.—Four tubercle bacilli, also short blue stained bacilli.

Lung (grey nodule).—No tubercle bacilli.*Gluteal Gland.*—No tubercle bacilli.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH FAECES OF COW A.

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
2635			Killed 92 days	No tuberculosis.
2636			Killed 92 days	No tuberculosis.
2637	September 30, 1907	Small doses varying up to 0·1 cc.	Killed 92 days	No tuberculosis.
2638			Killed 56 days	No tuberculosis.
2639			Killed 42 days	No tuberculosis.
2659		·05 cc.	Killed 30 days	No tuberculosis.
2660	October 2, 1907	·05 cc.	Killed 40 days	No tuberculosis.
2661		·05 cc.	Killed 55 days	No tuberculosis.
2662		·05 cc.	Killed 36 days	No tuberculosis.
2681		·05 cc.	Killed 88 days	No tuberculosis.
2682	October 4, 1907	·05 cc.	Killed 88 days	No tuberculosis.
2683		·5 cc.	Killed 88 days	No tuberculosis.
2684		·5 cc.	Killed 38 days	No tuberculosis.
2700		·05 cc	Killed 85 days	No tuberculosis.
2701	October 7, 1907	·05 cc	Killed 85 days	No tuberculosis.
2702		·05 cc.	Killed 85 days	No tuberculosis.
2703		·05 cc.	Killed 85 days	No tuberculosis.

GUINEA-PIGS FED WITH FAECES OF COW A.

DOSE IN EACH CASE 1·0 CUBIC CENTIMETRE OF FAECAL EMULSION.

Number.	Date of Feeding.	Duration of Life.	Result.
2640		Killed 99 days	No tuberculosis.
2641	September 30, 1907	Killed 99 days	No tuberculosis.
2655		Killed 98 days	No tuberculosis.
2656	October 1, 1907	Killed 98 days	No tuberculosis.
2663		Killed 99 days	No tuberculosis.
2664	October 2, 1907	Killed 99 days	No tuberculosis.
2675		Killed 98 days	No tuberculosis.
2676	October 3, 1907	Killed 98 days	No tuberculosis.
2679		Died 60 days	No tuberculosis.
2680	October 4, 1907	Killed 98 days	No tuberculosis.
2690		Killed 98 days	No tuberculosis.
2691	October 5, 1907	Killed 98 days	No tuberculosis.
2698		Killed 98 days	No tuberculosis.
2699	October 7, 1907	Killed 98 days	No tuberculosis.
2706		Killed 98 days	No tuberculosis.
2707	October 8, 1907	Killed 98 days	No tuberculosis.
2716		Killed 98 days	No tuberculosis.
2717	October 9, 1907	Killed 98 days	No tuberculosis.

GUINEA-PIGS FED CONTINUOUSLY WITH FAECES OF COW A MIXED WITH STERILIZED MILK.

Number.	Date of Feeding.	Duration of Life.	Result.
2629		Killed 57 days	No tuberculosis.
2630		Killed 98 days	No tuberculosis.
2631	From September 30, 1907, to October 9, 1907.	Killed 98 days	No tuberculosis.
2632		Died 5 days	No tuberculosis.
2633		Killed 106 days	No tuberculosis.
2634		Died 100 days	No tuberculosis.

PIG 204.

Fed with the faeces of Cow A from September 30, 1907, to October 9, 1907.

Dose—One-fourth part of 25·65 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—December 30, 1907. [91 days after the experiment began.]

Weights.	qrs. lbs.	November 28, 1907. [59 days after the experiment began.] No reaction.
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September 30, 1907	1 5
December 30, 1907	2 19

POST-MORTEM EXAMINATION.

Gain in weight.—1 qr. 14 lb.

Tuberculin Tests.—September 16, 1907. [14 days before experiment began.] No reaction.

General Condition.—Good. There was no tuberculosis of any organ or gland in the body.

PIG 206.

Fed with the faeces of Cow A from September 30, 1907, to October 9, 1907.

Dose—One-fourth part of 25·65 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—January 7, 1908. [99 days after the experiment began.]

Weights.				November 28, 1907. [59 days after the experiment began.] No reaction.
	qrs.	lbs.		
September 30, 1907	1 2	
January 7, 1908	2 16	

Gain in weight.—1 qr. 14 lbs.

Tuberculin Tests.—September 16, 1907. [14 days before the experiment began.] No reaction.

POST-MORTEM EXAMINATION.

Carcass in good condition. There was no sign of tuberculosis anywhere.

PIG 208.

Fed with the faeces of Cow A from September 30, 1907, to October 9, 1907.

Dose—One-fourth part of 25·65 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—January 7, 1908. [99 days after the experiment began.]

Weights.				November 28, 1907. [59 days after the experiment began.] No reaction.
	qrs.	lbs.		
September 30, 1907	1 3	
January 7, 1908	2 20	

Gain in weight.—1 qr. 17 lbs.

Tuberculin Tests.—September 16, 1907. [14 days before the experiment began.] No reaction.

POST-MORTEM EXAMINATION.

Carcass in good condition.
There was no sign of tuberculosis anywhere.

PIG 210.

Fed with the faeces of Cow A from September 30, 1907, to October 9, 1907.

Dose—One-fourth part of 25·65 kilogrammes of faeces.

Age—11 weeks.

Killed in good health—December 5, 1907. [66 days after feeding began.]

Weights.				lbs.	in firm pinkish grey tissue. The other glands consisted of firm grey tissue with a fine yellowish network.
September 30, 1907	...	...	28		
December 5, 1907	...	...	57		

Total gain in weight.—29 lbs.

Tuberculin Tests.—September 16, 1907. [14 days before experiment began.] Reaction: Negative.

November 28, 1907. [59 days after the experiment began.] Reaction: Positive.

Rise of temperature—2·3° Centigrade.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

On the Left Side of the Neck extending from below the angle of the jaw to the root of the ear, there was a chain of six glands the largest measuring 2·0 by 3·5 cm.; the smallest 1·6 by 1·2 cm. On section the largest consisted of a yellowish caseo-necrotic network

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were not enlarged and in one a single caseous focus was seen.

Spleen.—Normal.

Liver.—On the convex surface of the liver there were four grey tubercles with opaque centres up to a rape seed in size. On the concave surface there were two. On section through the substance no more were seen.

Portal Glands appeared normal.

Kidneys.—In the cortices of the kidneys there were scattered grey points.

Suprarenal Bodies.—Normal.*Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands.*
—Normal.*Thorax.*

Lungs.—In the left lung on the surface just beneath the pleura there were thirty caseating tubercles varying up to a hemp seed in size; there was about the same number on the right side; they were sparsely scattered throughout the parenchyma.

Bronchial Glands.—An occasional irregular caseous focus could be seen in the bronchial glands.

Precrural and Inguinal Glands.—Normal.*Microscopical Examination.*

(Smear preparations.)

Kidney (grey foci).—Moderately numerous tubercle bacilli seen.*Mesenteric Gland (focus).*—Eleven tubercle bacilli seen.*Bronchial Gland (focus).*—No tubercle bacilli seen.**COW D.****POST-MORTEM EXAMINATION.**

Animal fat and in good condition.

Thorax.

On opening the Thoracic Cavity there were numerous firm fibrous adhesions connecting the visceral and parietal pleurae. On the visceral side of these adhesions there were, in a majority of cases, nodules in the lung substance.

Lungs. *Left Lung.*—There was an adhesion between the anterior and the posterior lobes. The lung substance was pink and crepitant. The anterior lobe contained three nodules, the two largest the size of a sparrow's eggs; they consisted of yellow caseo-necrotic substance enclosed within fibrous capsules. In the posterior lobe there were eight large nodules varying from a large pea up to a mass 10·0 by 6·0 by 5·0 cm.; there were three nearly equal to the latter in size. On section they were composed of masses of yellow softening necrotic substance surrounded by fibrous walls. In the lung parenchyma, there were also seen scattered translucent tubercles with caseous centres varying up to a hemp seed in size.

Right Lung.—The anterior lobe contained five nodules up to a large pea in size and scattered translucent tubercles. The middle lobe contained a few nodules the largest the size of a pigeon's egg. The caudal lobe contained scattered nodules, about sixteen counted, varying in size up to a pigeon's egg, they all consisted of yellow caseo-necrotic substance in many cases becoming soft and purulent; there were also scattered minute translucent tubercles and nodules varying from a hemp seed up to a wheat grain in the substance. Several of the nodules were surrounded by pneumonic patches beset with caseous foci. A few of the softening nodules communicated with the smaller bronchi. Muco-pus could be squeezed from many of the bronchioles and soft caseous substance was seen in several of the larger bronchi.

Thoracic Lymphatic Glands.—The caudal medi-

astinal gland measured 24·0 by 7·0 by 5·0 cm. One half of it was much larger than the other and was firm and nodular. On section, the whole gland was replaced by bright yellow caseo-necrotic gritty masses, softening in many parts, disposed in a matrix of fibrous translucent tissue; the other mediastinal glands were a little enlarged and firm, and on section were more than half replaced by similar masses.

The bronchial glands were very slightly enlarged and resembled the mediastinal glands.

*Abdomen.**Omentum.*—Normal.*Intestines.*—Normal.*Mesenteric and Colic Glands.*—Normal.*Spleen.*—Normal.

Liver.—In the centre of the liver there was a nodule of yellow caseo-purulent substance containing gritty foci lying in a bile duct with thickened walls.

Portal Glands.—Normal.*Kidneys.*—Normal.*Suprarenal Bodies.*—Normal.*Renal, Coeliac, Lumbar, and Iliac Glands.*—Normal.*Ovaries and Uterus.*—Normal.*Supramammary Lymphatic Glands.*—Normal.*Udder.*—Normal.*Tongue, Tonsils, Larynx, and Pharynx.*—Normal.*Various Lymphatic Glands.*

Parotid, Submaxillary, Pharyngeal, Cervical, Pre-scapular, Prepectoral, Axillary, Precrural, Gluteal, Ischiatic, and Popliteal Glands.—Normal.

Microscopical Examination.

(Smear preparation.)

Liver (pus).—No tubercle bacilli seen.**GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH A THICK EMULSION OF THE FAECES OF COW D.**

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
3017		.05 cc.	Killed 62 days	No tuberculosis.
3018	February 20, 1908	.05 cc.	Died 10 days	In the omentum there were several minute translucent tubercles containing moderately numerous tubercle bacilli.
3019		.05 cc.	Died 61 days	No tuberculosis.
3027	February 21, 1908	.05 cc.	Killed 61 days	No tuberculosis.
3028		.1 cc.	Killed 39 days	Three translucent foci and a small grey tubercle in omentum. No tuberculosis elsewhere. Smear from omentum showed moderately numerous acid fast bacilli.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH A THICK EMULSION OF THE
FAECES OF COW D—*continued.*

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
3133		.05 cc.	Died 14 days	No tuberculosis.
3134		.05 cc.	Died 3 days	No tubercalosis.
3135		.05 cc.	Killed 45 days	Early general tuberculosis. Culture isolated.
3136	March 24, 1908	.05 cc.	Died 4 days	No tuberculosis.
3137		.05 cc.	Killed 45 days	Caseation of pyloric and portal glands. Smear showed moderately numerous tubercle bacilli. Culture isolated.
3138		.05 cc.	Killed 45 days	No tuberculosis.

RABBITS INOCULATED INTRAPERITONEALLY WITH A THICK EMULSION OF THE FAECES OF COW D.

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
1692	February 21, 1908	.05 cc.	Killed 82 days	Omentum contained caseating miliary tubercles. Caseous tubercles on diaphragm and in lungs. Caseation of pyloric and portal glands.
1693	February 21, 1908	.1 cc.	Killed 82 days	Omentum greatly thickened and caseated. Caseous nodules on caecum, mesentery, and diaphragm. Lungs closely filled with caseating tubercles. Tubercles in spleen and kidneys.
1694	February 21, 1908	.2 cc.	Killed 74 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW D.

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
3013		6.0 cc. plus the deposit 24.0 cc. obtained by the centrifuge.	R.F.	Died 26 days	Whitish tubercle in omentum containing moderately numerous acid fast bacilli. No tuberculosis elsewhere.
3014	February 20, 1908		R.H.	Died 21 days	No tuberculosis.
3015			L.F.	Killed 62 days	No tuberculosis.
3016			L.H.	Killed 62 days	No tuberculosis.
3037			R.F.	Killed 35 days	No tuberculosis.
3038			R.F.	Killed 67 days	No tuberculosis.
3039			R.H.	Killed 35 days	No tuberculosis.
3040	February 24, 1908	do.	R.H.	Killed 67 days	No tuberculosis.
3041			L.F.	Killed 58 days	No tuberculosis.
3042			L.F.	Killed 67 days	No tuberculosis.
3043			L.H.	Killed 58 days	No tuberculosis.
3044			L.H.	Killed 67 days	No tuberculosis.
3045			R.F.	Died 2 days	No tuberculosis.
3046			R.F.	Died 62 days	Two translucent foci in omentum. No tuberculosis elsewhere.
3047			R.H.	Died 1 day	No tuberculosis.
3048			R.H.	Killed 66 days	No tuberculosis.
3049	February 25, 1908	do.	L.F.	Killed 58 days	One translucent miliary nodule in the ligament of liver. No tuberculosis else.
3050			L.F.	Killed 66 days	No tuberculosis.
3051			L.H.	Died 58 days	Three tubercles in omentum; no T.B. No tuberculosis elsewhere.
3052			L.H.	Died 42 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW D—*continued.*

Number.	Date of Inoculation.	Dose.	Quarter of Udder.	Duration of Life.	Result.
3087			R.F.	Killed 50 days	No tuberculosis.
3088			R.F.	Died 6 days	No tuberculosis.
3089			R.H.	Killed 42 days	
3090	March 13, 1908	60·0 cc. plus the deposit 24·0 cc. obtained by the centrifuge.	R.H.	Killed 50 days	Two tubercles in omentum and two on peritoneum containing acid fast bacilli. No tuberculosis elsewhere. No tuberculosis.
3091			L.F.	Killed 42 days	One yellowish nodule in omentum and one on liver containing acid fast bacilli. No tuberculosis elsewhere.
3092			L.F.	Killed 50 days	No tuberculosis.
3093			L.H.	Killed 43 days	No tuberculosis.
3094			L.H.	Killed 50 days	No tuberculosis.
3095			R.F.	Killed 55 days	No tuberculosis.
3096			R.F.	Killed 55 days	No tuberculosis.
3097			R.H.	Died 29 days	Three translucent foci in the omentum. No tuberculosis elsewhere.
3098			R.H.	Killed 55 days	No tuberculosis.
3099	March 14, 1908	do.	L.F.	Killed 55 days	No tuberculosis.
3100			L.F.	Killed 55 days	In omentum there was a yellowish miliary nodule containing soft caseous substance. Smear showed a few acid fast bacilli.
3101			L.H.	Killed 55 days	In omentum two similar but smaller nodules. Smear showed small acid fast bacilli.
3102			L.H.	Killed 55 days	Four similar bodies in omentum. Smear showed doubtful acid fast bacilli.
3103			R.F.	Died 39 days	No tuberculosis.
3104			R.F.	Killed 47 days	No tuberculosis.
3105			R.H.	Killed 39 days	No tuberculosis.
3106			R.H.	Killed 47 days	No tuberculosis.
3107	March 16, 1908	do.	L.F.	Killed 47 days	No tuberculosis.
3108			L.F.	Died 10 days	Three minute whitish tubercles in omentum containing acid fast bacilli. No tuberculosis elsewhere.
3109			L.H.	Died 39 days	No tuberculosis.
3110			L.H.	Killed 47 days	No tuberculosis.
3111			R.F.	Killed 38 days	Purulent nodule in subcutaneous tissue showed no acid fast bacilli. No tuberculosis elsewhere.
3112			R.F.	Killed 42 days	No tuberculosis.
3113			R.H.	Killed 38 days	Purulent nodule in subcutaneous tissue containing numerous acid fast bacilli. No tuberculosis elsewhere.
3114	March 17, 1908	do.	R.H.	Killed 42 days	No tuberculosis.
3115			L.F.	Killed 38 days	No tuberculosis.
3116			L.F.	Killed 42 days	No tuberculosis.
3117			L.H.	Killed 38 days	No tuberculosis.
3118			L.H.	Killed 42 days	In omentum three minute grey tubercles. No acid fast bacilli.
3119			R.F.	Killed 43 days	No tuberculosis.
3120			R.F.	Died 6 days	No tuberculosis.
3121			R.H.	Died 1 day	No tuberculosis.
3122			R.H.	Killed 43 days	No tuberculosis.
3123	March 23, 1908	do.	L.F.	Killed 32 days	No tuberculosis.
3124			L.F.	Killed 43 days	No tuberculosis.
3125			L.H.	Killed 43 days	No tuberculosis.
3126			L.H.	Died 27 days	No tuberculosis.

COW E.

POST-MORTEM EXAMINATION.

General Condition.—Good.*Thorax.**Pleura.*—Normal.*Lungs.*—In the right lung in close proximity to each other there were three loculated cystic nodules, the largest the size of a robin's egg; they were lined by reddish grey granulation tissue, and several of the small spaces in them contained a little muco-pus.*Thoracic Lymphatic Glands.*—A left bronchial gland contained a soft grey nodule the size of a millet seed.

The long mediastinal gland contained 30 to 40 nodules varying up to a pea in size; they were yellowish caseo-calcareous and easily shelled out of the gland substance, leaving smooth walled cavities.

*Abdomen.**Intestines.*—Normal.*Gastric, Mesenteric, and Colic Glands.*—Normal.*Spleen.*—Normal.*Liver.*—In the liver were sparsely scattered, irregular yellowish grey submiliary nodules situated just beneath the surface only; they were different from tuberculous nodules in appearance.*Portal Glands.*—Normal.*Kidneys.*—In the kidneys there were visible on the surface several pale grey patches of tissue which on section extended through the pyramids.*Suprarenal Bodies.*—In a suprarenal body just beneath the cortex there was a yellowish grey nodule the size of a rape seed.*Abdominal Lymphatic Glands.**Renal, Lumbar, Celiac, and Iliac Glands* appeared normal.*Tongue, Tonsils, Larynx, and Pharynx.*—Normal.*Uterus.*—The uterus was pregnant and contained a foetus of about six months; the uterus, placenta, and foetus were normal.*Various Lymphatic Glands.**Submaxillary, Pharyngeal, Cervical, Prescapular, Axillary, Precurral, Gluteal, Ischiatic, and Popliteal Glands.*—Normal.*Udder and Supramammary Lymphatic Glands.*—Normal.*Microscopical Examinations.**(Smear preparations.)**Suprarenal (nodule).*—Two tubercle bacilli.*Bronchial Gland (nodule).*—No tubercle bacilli.*Lung (Cyst I and II).*—No tubercle bacilli.*Liver (nodule).*—No tubercle bacilli.*Kidney (grey patch).*—No tubercle bacilli.*Mediastinal Gland (I and II).*—No tubercle bacilli.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE FAECES OF COW E.

Number.	Date of Inoculation.	Dose.	Duration of Life.	Result.
3020		.05 cc.	Killed 62 days	No tuberculosis.
3021	{ February 20, 1908	.05 cc.	Killed 62 days	No tuberculosis.
3022		.05 cc.	Died 18 days	No tuberculosis.
3065		.05 cc.	Killed 57 days	No tuberculosis.
3066	{ February 26, 1908	.05 cc.	Died 2 days	No tuberculosis.
3067		.05 cc.	Died 1 day	No tuberculosis.
3068		.05 cc.	Died 1 day	No tuberculosis.
3081		.05 cc.	Killed 50 days	No tuberculosis.
3082		.05 cc.	Died 39 days	No tuberculosis.
3083	{ March 18, 1908	.05 cc.	Killed 50 days	No tuberculosis.
3084		.05 cc.	Killed 50 days	No tuberculosis.
3085		.05 cc.	Killed 53 days	No tuberculosis.
3086		.05 cc.	Killed 53 days	No tuberculosis.
3119		.05 cc.	Killed 51 days	No tuberculosis.
3120		.05 cc.	Killed 51 days	No tuberculosis.
3121	{ March 18, 1908	.05 cc.	Killed 51 days	No tuberculosis.
3122		.05 cc.	Killed 56 days	No tuberculosis.
3123		.05 cc.	Killed 56 days	No tuberculosis.

GUINEA-PIGS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW E.

Number.	Date of Inoculation.	Dose of Milk.	Quarter of Udder.	Duration of Life.	Result.
3023		6·0 cc. plus the deposit of 24·0 cc. obtained by the centrifuge.	R.F.	Died 59 days	No tuberculosis.
3024	February 21, 1908		R.H.	Killed 61 days	A translucent focus in omentum which contained acid-fast bacilli. No tuberculosis elsewhere.
3025			L.F.	Died 40 days	No tuberculosis.
3026			L.H.	Killed 61 days	No tuberculosis.
3029			R.F.	Died 32 days	No tuberculosis.
3030			R.F.	Killed 67 days	No tuberculosis.
3031			R.H.	Died 35 days	No tuberculosis.
3032	February 24, 1908	do.	R.H.	Died 62 days	No tuberculosis.
3033			L.F.	Died 41 days	No tuberculosis.
3034			L.F.	Died 63 days	No tuberculosis.
3035			L.H.	Killed 58 days	No tuberculosis.
3036			L.H.	Killed 67 days	No tuberculosis.
3053		5·0 cc. plus the deposit of 10·0 cc.	R.F.	Killed 58 days	No tuberculosis.
3054			R.F.	Killed 66 days	No tuberculosis.
3055		12·0 cc. plus the deposit of 12·0 cc.	R.H.	Died 18 days	No tuberculosis.
3056	February 25, 1908		R.H.	Died 21 days	No tuberculosis.
3057		10·0 cc.	L.F.	Killed 58 days	No tuberculosis.
3058			L.F.	Killed 66 days	No tuberculosis.
3059		5·0 cc. plus the deposit of 10·0 cc.	L.H.	Died 23 days	No tuberculosis.
3060			L.H.	Died 11 days	Two minute whitish foci in the omentum; smear showed acid-fast bacilli. No tuberculosis elsewhere.
3061		6·0 cc.	R.F.	Died 29 days	No tuberculosis.
3062		10·0 cc.	R.H.	Killed 57 days	No tuberculosis.
3063	February 26, 1908	6·0 cc.	L.F.	Died 16 days	Opaque yellowish nodule in subcutaneous tissue (no A.F.B.). No tuberculosis elsewhere.
3064		9·0 cc.	L.H.	Died 33 days	No tuberculosis.
3069		4·0 cc.	R.F.	Killed 64 days	No tuberculosis.
3070		4·0 cc.	R.F.	Died 16 days	No tuberculosis.
3071		7·0 cc.	R.H.	Killed 56 days	No tuberculosis.
3072	February 27, 1908	7·0 cc.	R.H.	Killed 64 days	No tuberculosis.
3073		3·0 cc.	L.F.	Killed 56 days	No tuberculosis.
3074		3·0 cc.	L.F.	Killed 64 days	No tuberculosis.
3075		3·0 cc.	L.H.	Killed 56 days	No tuberculosis.
3076		3·0 cc.	L.H.	Killed 64 days	No tuberculosis.
3077		6·0 cc.	R.F.	Killed 60 days	No tuberculosis.
3078	March 3, 1908	10·0 cc.	R.H.	Killed 60 days	No tuberculosis.
3079		8·0 cc.	L.F.	Killed 60 days	No tuberculosis.
3080		4·0 cc.	L.H.	Killed 60 days	No tuberculosis.

RABBITS INOCULATED INTRAPERITONEALLY WITH THE MILK OF COW E.

Number.	Date of Inoculation.	Dose of Milk.	Quarter of Udder.	Duration of Life.	Result.
1683	February 21, 1908	6·0 cc. plus the deposit of 24·0 cc. obtained by the centrifuge.	R.F.	Killed 85 days	No tuberculosis.
1684			R.H.	Killed 85 days	No tuberculosis.
1685			L.F.	Killed 85 days	No tuberculosis.
1686			L.H.	Killed 85 days	No tuberculosis.

SWINE FED CONTINUOUSLY WITH THE MILK OF COW D AND COW E.

Number.	Cow.	Duration of Feeding and Dose.	Duration of Life.	Result.
254	D	{ 9 days, 7 litres each	Killed 88 days	No tuberculosis.
256	D	{ 9 days, 7 litres each	Killed 88 days	No tuberculosis.
250	E	{ 4 days, 65·0 cc. each	Killed 88 days	No tuberculosis.
252	E	{ 4 days, 65·0 cc. each	Killed 88 days	No tuberculosis.

SWINE FED CONTINUOUSLY WITH THE FAECES OF COW D AND COW E.

Number.	Cow.	Duration of Feeding and Dose.	Duration of Life.	Result.
238	D	{ 14 days, 27 kilogrammes to each.	Killed 79 days	No tuberculosis.
240	D	{ 14 days, 27 kilogrammes to each.	Killed 99 days	No tuberculosis.
242	E	{ 14 days, 21 kilogrammes to each.	Killed 79 days	No tuberculosis.
244	E	{ 14 days, 21 kilogrammes to each.	Killed 101 days	No tuberculosis.

CONTROL ANIMALS TO EXPERIMENTS ON SWINE.

PIG 220.

Reserved as a control to the litter to which belonged Pigs 204, 206, 208, 210, 212, 214, 216 and 218. The length of life of the experimental animals in this litter after the commencement of the experiment varied from 63 to 100 days.

Tuberculin test : September 16th, 1907. Result : Negative.

Killed : December 30th, 1907. Four months under observation.

Post-mortem examination : The animal was found to be healthy, and showed no sign of tuberculosis.

PIG 232.

Reserved as a control to the litter to which belonged Pigs 222, 224, 226 and 230. The experimental animals in this litter lived from 48 to 86 days after the commencement of the experiment.

Tuberculin test : October 11th, 1907. Result : Negative.

Killed : December 30th, 1907. After three months under observation.

Post-mortem examination : The animal was found to be healthy and showed no sign of tuberculosis.

The third litter contained Pigs 238, 240, 242, 244, 250, 252, 254 and 256. No control was kept, but all the experimental animals were found to be quite healthy when killed.



